# Station List of the "Calanus" Expeditions, 1947-50

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"CALANUS" SERIES, NO. 1

ABSTRACT

A list is given of 167 stations where biological or oceanographic observations or collections were made, in Ungava Bay and adjacent waters.

## INTRODUCTION

The Fisheries Research Board Eastern Arctic Investigations have been continued in Ungava Bay and adjacent waters for four seasons, 1947-50, and the mass of material collected is in process of being worked out. The field of operations is being shifted to Baffin Island in 1951. Following the modern practice of expedition series of this sort, the station list for the four seasons is published separately here, together with the necessary maps, so that reference to stations can be made in the forthcoming papers of the "Calanus" series without the tedious and expensive process of repeating lists and maps in each separate publication. Dates at which stations were occupied are not included; many stations were occupied more than once, and all relevant information in the matter of dates will appear in the publication of results.

The "Calanus" herself was built in 1948, and was used in the field during the seasons of 1949 and 1950. Smaller, locally owned boats were chartered in 1947 and 1948. The name "Calanus", however, is here applied to all individual expeditions made under the Eastern Arctic Investigations, for convenience and ease of reference.



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## LIST OF STATIONS

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| **1947** | | | | | |
| 1 | 7 miles north of Koksoak River mouth | 58°39′ | 68°15′ | 18-31 | plankton hauling, hydrographic |
| 1A | False River | 58°24.5′ | 67°58′ | — | littoral collecting |
| 2 | Koksoak River | 58°27′ | 68°12′ | 11 | plankton hauling, hand-line fishing |
| 3 | 18 miles north of Koksoak River mouth | 58°50′ | 68°13′ | 28 | plankton hauling, benthos (dredging), hydrographic |
| 4 | between Leaf Bay and Koksoak River | 58°45′ | 68°21′ | shallow | hand-line fishing |
| 5 | south of Station 4 | 58°39′ | 68°20′ | shallow-0 | littoral collecting, hand-line fishing |
| 6 | Kassigiaksiovik River mouth, Leaf Bay | 58°52′ | 68°58′ | 5-0 | plankton hauling, littoral collecting, seine fishing |
| 7 & 54 | Leaf Bay | 58°55′ | 68°53′ | 10 | plankton hauling, benthos (dredging), hydrographic |
| 8 | Leaf Bay | 58°52′ | 68°54′ | — | littoral collecting |
| 9 | Leaf Bay | 59°02′ | 68°43′ | 24 | plankton hauling |
| 10 | Leaf Bay | 58°53′ | 69°03′ | 4-5 | hand-line fishing |
| 11 | 6 miles north-east of Gyrfalcon Islands | 59°11′ | 68°47′ | 46 | benthos (dredging), hand-line fishing, hydrographic |
| 12 | northeast of Hopes Advance Bay | 59°30′ | 69°10′ | 4-5 | littoral collecting, hand-line fishing |
| 13 | near Station 12 | 59°30′ | 69°00′ | 46-55 | plankton hauling, long-line fishing |
| 14 | 10 miles east by south from Payne Bay | 59°55′ | 69°21′ | 53 | sounding |
| 15 | Payne Bay | 59°58′ | 69°43′ | 18 | sounding |
| 16 | Payne Bay | 60°01′ | 70°01′ | 5-0 | littoral collecting, hand-line fishing |
| 17 | southeast of Tuvalik, Payne Bay | 60°01′ | 69°25′ | 62 | long-line fishing |
| 18 | east of Tuvalik | 60°02′ | 69°03′ | 84 | plankton hauling, hydrographic |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 19 | Payne Bay | 60°03′ | 69°40′ | shallow | hand-line fishing, long-line fishing |
| 20 | 4 miles west of Station 14 | 59°53′ | 69°29′ | less than 64 | benthos (dredging) |
| 21 | 5 miles west of Station 14 | 59°54′ | 69°31′ | 64 | benthos (dredging) |
| 22 | Inuksulik (1), 10 miles north of Gyrfalcon Islands | 59°18′ | 68°57′ | 9-11 | plankton hauling, hand-line fishing |
| 23 | north of Leaf Bay | 59°05′ | 69°04′ | — | littoral collecting |
| 24 | near Station 23 | 59°06′ | 69°00′ | 7 | sounding |
| 25 | 3 miles north-east of Gyr-falcon Islands | 59°08′ | 68°48′ | 35 | benthos (dredging), hydrographic |
| 26 | Leaf Bay | 58°56.5′ | 69°02′ | 29 | sounding |
| 27 | Leaf Bay | 58°55.5′ | 69°01′ | 47 | benthos (dredging) |
| 28 | Leaf Bay | 58°54.5′ | 68°59′ | 27 | benthos (dredging), hand-line fishing |
| 29 | between Leaf Bay and Kok-soak River | 58°47′ | 68°21′ | — | sealing |
| 30 | 10 miles north of Koksoak River mouth | 58°42.5′ | 68°10′ | 36 | benthos (dredging) |
| 31 & 65 | Inukshuktuyuk, in Koksoak River | 58°31.5′ | 68°12′ | shallow-0 | plankton hauling, littoral collecting |
| 32 | 18 miles north by east of mouth of George River | 59°04′ | 65°57′ | 7-9 | hand-line fishing |
| 33 | Keglo Bay | 59°13′ | 65°45′ | shallow 18-27<br>27 | plankton hauling, benthos (dredging), hand-line fishing, long-line fishing, hydrographic |
| 34 | 24 miles north of George River mouth | 59°16′ | 66°17′ | 47 | hand-line fishing, hydrographic |
| 35 | Keglo Bay | 59°10′ | 65°44′ | 5 | sounding |
| 36 | Keglo Bay | 59°12′ | 65°41′ | 7-13 | hand-line fishing |
| 37 | Keglo Bay | 59°05.5′ | 65°45′ | 3-4 | plankton hauling |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 38 | Keglo Bay | 59°03′ | 65°47′ | shallow | plankton hauling |
| 39 | George River | 58°33.5′ | 65°57.5′ | — | gill-net fishing |
| 40 | Keglo Bay | 59°02′ | 65°48′ | shallow-0 | plankton hauling, littoral collecting |
| 41 | 29 miles west of Adlorilik | 59°34′ | 66°24′ | 240 | plankton hauling, hydrographic |
| 42 & 73 | 4 miles north of Adlorilik | 59°34.5′ | 65°27′ | 7-9 | hand-line fishing |
| 43 | Port Burwell, inner harbour | 60°24.8′ | 64°49.9′ | shallow | plankton hauling, hand-line fishing |
| 44 | Forbes Sound | 60°23.5′ | 64°50.5′ | 80 | plankton hauling, long-line fishing, hand-line fishing, hydrographic |
| 45 | Port Burwell, outer harbour | 60°24.5′ | 64°50.5′ | 27-37 | benthos (dredging), long-line fishing, hand-line fishing |
| 46 | Forbes Sound | 60°23.5′ | 64°52.5′ | 92-110 | long-line fishing |
| 47 | Forbes Sound | 60°22.8′ | 64°52′ | 110 | long-line fishing |
| 48 | 12 miles south by west of Port Burwell | 60°14′ | 64°58′ | 14-18 | hand-line fishing |
| 49 | Adlorilik | 59°29′ | 65°26′ | — | littoral collecting |
| 50 | 9 miles south-west of Beacon Island, mouth of George River | 58°45′ | 66°37′ | — | |
| 51 & 235 | Pitulaksitik, between Whale River and George River | 58°29.5′ | 66°55′ | shallow-0 | plankton hauling, littoral collecting |
| 52 | 8 miles north of False River mouth | 58°37′ | 67°51′ | 16-17 | benthos (dredging) |
| | **1948** | | | | |
| 53 | 5 miles north of Inukshuktuyuk Point, mouth of Koksoak River | 58°38′ | 68°13′ | 9 | plankton hauling, benthos (dredging) |
| 54 & 7 | Leaf Bay | 58°55′ | 68°53′ | — | plankton hauling |
| 55 | 10 miles east of Gyrfalcon Islands | 59°08′ | 68°34′ | 85 | long-line fishing, hydrographic |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 56 | 23 miles north-east of Whale River mouth | 58°37′ | 67°06′ | 18 (at least) | plankton hauling, benthos (dredging), hydrographic |
| 57 | 10 miles north by west of Keglo Bay | 59°21′ | 66°00′ | 96<br>shallow | plankton hauling, hydrographic, hand-line fishing |
| 58 | 20 miles south by west of Port Burwell | 60°05′ | 65°06′ | 20 | benthos (dredging) |
| 59 | Forbes Sound | 60°24′ | 64°51′ | 15<br>54 | benthos (dredging), hand-line fishing, hydrographic |
| 60 | Young Inlet southeast of Port Burwell | 60°19.8′ | 64°40.5′ | 28 (at least)<br>36 (at least) | plankton hauling, long-line fishing, hydrographic |
| 61 | west of Munro Harbour | 60°24′ | 64°55′ | 45<br>64 | long-line fishing, hydrographic |
| 62 | between Bush and Killinek Islands | 60°29′ | 64°44′ | 29 | plankton hauling, hand-line fishing, hydrographic |
| 63 | Forbes Sound | 60°22.5′ | 64°48.5′ | — | plankton hauling |
| 64 | False River | 58°27.5′ | 67°56′ | — | littoral collecting |
| 65 & 31 | Koksoak River | 58°31.5′ | 68°12′ | — | littoral collecting |
| 66 | Burwell, outer harbour | 60°24.4′ | 64°50′ | — | littoral collecting |
| 67 | inner harbour, Burwell | 60°24.8′ | 64°49.6′ | — | littoral collecting |
| 68 & 120 | tidal lake, southeast of Port Burwell | 60°24.5′ | 64°49′ | — | littoral collecting |
| 69 | south of Young Inlet | 60°20.5′ | 64°44.5′ | — | littoral collecting |
| 70 | Port Burwell, inner harbour | 60°25.1′ | 64°50.2′ | — | littoral collecting |
| 71 | McLelan Strait | 60°22′ | 64°44′ | 36 | long-line fishing |
| 72 | mouth of George River | 58°50′ | 66°21′ | 18 | hand-line fishing |
| 73 & 42 | 4 miles north of Adlorilik | 59°34.5′ | 65°27′ | 15 | hand-line fishing |
| 74 | Forbes Sound | 60°24′ | 64°50′ | 14-18 | hand-line fishing |
| 75 | Young Inlet (various points) | | | 5-30 | hand-line fishing |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 76 | mouth of Young Inlet | 60°21.5′ | 64°46.5′ | 18 | hand-line fishing |
| 77 | Forbes Sound | 60°22.5′ | 64°48.8′ | 18-27 | hand-line fishing |
| 78 | west end of McLelan Strait | 60°22.3′ | 64°46.7′ | 46 | hand-line fishing |
| 79 | between Bush and Killinek Islands | 60°28.5′ | 64°43.2′ | 18 | hand-line fishing |
| 80 | Port Harvey, northern Killinek Island | 60°28.5′ | 64°41.4′ | 22 | hand-line fishing |
| 81 | southern Lenz Strait, north of Killinek Island | 60°29.1′ | 64°49′ | 5 | hand-line fishing |
| 82 | Amittoq Inlet, 1 mile northwest of Port Burwell | 60°25.9′ | 64°51.5′ | 27 | hand-line fishing |
| 83 | 1 mile north of Amittoq Inlet | 60°26.8′ | 64°52.1′ | 18 | hand-line fishing |
| 84 | south by west of Munro Harbour | 60°24.4′ | 64°52.8′ | 18-21 | hand-line fishing |
| 85 | west of Munro Harbour | 60°24.4′ | 64°56′ | 100 | long-line fishing |
| 86 | 12 miles south by west from Port Burwell | 60°13′ | 64°58′ | 9 | hand-line fishing |
| 87 | 5 miles south by west of Station 86 | 60°08′ | 65°03′ | 9 | hand-line fishing |
| 88 | 3 miles south by west of Station 87 | 60°05.5′ | 65°05′ | 27 | hand-line fishing |
| 89 | 25 miles north of Adlorilik | 59°57′ | 65°14′ | 18 | hand-line fishing |
| 90 | 1 mile north of Adlorilik | 59°31′ | 65°25′ | 9-30 | hand-line fishing |
| 91 | 8 miles west by south of Adlorilik | 59°27′ | 65°40′ | 5-36 | hand-line fishing |
| 92 | between George and Whale Rivers | 58°32′ | 66°56′ | 11 | hand-line fishing |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| **1949** | | | | | |
| 101 | 2 miles south-east of Beacon Island, mouth of George River | 58°52′ | 66°23′ | 18 | plankton hauling |
| 102 | Forbes Sound | 60°23.5′ | 64°52′ | 90-130 | benthos (trawling), benthos (dredging) |
| 103 | 2 miles west of Jackson Island, west of Port Burwell | 60°24′ | 64°58′ | 145-275 (depth varied)<br>290 | plankton hauling, benthos (dredging), benthos (trawling), long-line fishing, hydrographic |
| 104 | west of Jackson Island | 60°26′ | 65°10′ | 255 | plankton hauling |
| 105 | Port Burwell, outer harbour | 60°24.2′ | 64°51′ | 15-28 | hand-line fishing, hydrographic |
| 106 | 3 miles west of Cape William Smith | 60°21′ | 64°58′ | 100-110 | plankton hauling, benthos (dredging) |
| 107 | Forbes Sound | 60°22′ | 64°47′ | 55-73 | benthos (dredging), long-line fishing |
| 107A | Mission Cove, Port Burwell | 60°25.2′ | 64°50.8′ | — | littoral collecting |
| 107B | inlet south of Mission Cove | 60°25.05′ | 64°50.9′ | — | littoral collecting |
| 108 | Hydrographic section from Port Burwell to Akpatok Island | 60°22′ | 65°42′ | 360 | hydrographic |
| 109 | | 60°23′ | 66°25′ | 110 | hydrographic |
| 110 | | 60°24′ | 66°52′ | 115 | hydrographic |
| 111 | | 60°24′ (position uncertain) | 67°35′ | 57-63 | hydrographic |
| 112 & 205 | Imilik | 60°46′ | 69°27′ | — | littoral collecting |
| 113 | Hydrographic section from Payne Bay to Akpatok Island | 60°05′ | 69°17′ | 60-75 | hydrographic |
| 114 | | 60°08′ | 68°50′ | 145 | hydrographic |
| 115 | | 60°10′ | 68°26′ | 225 | hydrographic |
| 116 | Hydrographic section from Akpatok to the Koksoak River | 59°50′ | 68°30′ | 145 | hydrographic |
| 117 | | 59°25′ | 68°45′ | 100 | hydrographic |
| 118 | | 59°04′ | 68°12′ | 32 | hydrographic |
| 119 | Forbes Sound | 60°23.8′ | 64°52.2′ | 127 | long-line fishing |
| 120 & 68 | tidal lake, southeast of Port Burwell | 60°24.5′ | 64°49′ | — | shark |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 121 | Forbes Sound | 60°22.2′ | 64°47.3′ | 28-55 | hand-line fishing |
| 122 | Fox Harbour | 60°25.7′ | 64°52.2′ | 28-55 | hand-line fishing |
| 123 | Calanus Harbour, Button Islands | 60°39.5′ | 64°41.8′ | —<br>15<br>7 | littoral collecting, plankton hauling, hand-line fishing, hydrographic |
| 123A | mouth of Koksoak River | 58°31.5′ | 68°10′ | shallow | plankton hauling |
| 124 | north by west of Inuksulik (1) | 59°25′ | 69°00′ | — | plankton hauling |
| 125 | Payne Bay | 60°00′ | 70°04′ | 18 | plankton hauling |
| 125A | Payne Bay | 60°03′ | 69°37′ | 12 | plankton hauling, hand-line fishing |
| 126 | Hydrographic section from Payne | 60°04′ | 69°26′ | 70-91 | benthos (dredging), benthos (trawling), hydrographic |
| 127 | Bay to | 60°07′ | 69°07′ | 106 | hydrographic |
| 128 | Akpatok Island | 60°12.5′<br>60°14′ | 68°27′<br>68°26′ | 185<br>185 | hydrographic<br>plankton hauling |
| 129 | 10 miles north of Koksoak River mouth | 58°43.3′ | 68°17′ | — | plankton hauling |
| | **1950** | | | | |
| 201A | Adlorilik | 59°29′ | 65°18.5′ | 0-12 | littoral collecting, hydrographic |
| 201B | Adlorilik | 59°22′ | 64°58′ | 0-18 | littoral collecting, hand-line fishing, hydrographic |
| 201C | Adlorilik | 59°29.5′ | 65°20.5′ | 80-100 | plankton hauling, benthos (dredging), hydrographic |
| 202 | 10-mile radius from 25 miles NNW of George River mouth | | | — | sealing |
| 203 | 5 miles northeast of Inuksulik (2) | 58°50′ | 68°18′ | 30 | plankton hauling, benthos (dredging) |
| 204 | Inuksulik (2) | 58°47′ | 68°23′ | — | littoral collecting |
| 205 & 112 | Imilik | 60°46′ | 69°27′ | 0-18 | littoral collecting, hydrographic |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 206 | 5 miles east of Imilik | 60°45′ | 69°17′ | 55-90 | plankton hauling, benthos (dredging) |
| 207 | Eider Islands | 60°53′ | 69°19′ | 27-91 | long-line fishing |
| 208 | 400 yards north of Cape Hopes Advance | 61°05.3′ | 69°34′ | 80-90 | plankton hauling, benthos (dredging), long-line fishing |
| 208A | 3 miles north of Cape Hopes Advance | 61°08′ | 69°33′ | 195 | hydrographic |
| 208B | Cape Hopes Advance | 61°05′ | 69°33′ | — | littoral collecting |
| 209 | 5 miles north of Cape Hopes Advance | 61°10′ | 69°33′ | 183 | plankton hauling |
| 210 | Diana Bay, east of Hearn Island | 61°04.5′ | 69°39′ | 90-110 | long-line fishing, benthos (dredging) |
| 211 | Diana Bay, 1 mile west of Koaktuk | 61°02.5′ | 69°41.5′ | | plankton hauling |
| 212 | Diana Bay, Koaktuk | 61° 02′ | 69°38′ | shallow-0 | plankton hauling, benthos collecting, littoral collecting, hand-line fishing |
| 213 | Diana Bay, 1 mile south, west of Hearn Island | 61°03.5′ | 69°44′ | 90 | long-line fishing |
| 214 | Diana Bay, ½ mile north-east of Station 213 | 61°03.8′ | 69°43.5′ | 90 | long-line fishing |
| 215 | Diana Bay, south | 60°49.5′ | 69°52′ | — | littoral collecting |
| 216 | Diana Bay, south | 60°49.5′ | 69°56′ | 18-20 | benthos (dredging) |
| 217 | Wakeham Bay | 61°41′ | 71°56′ | 18-0 | littoral collecting, plankton hauling, benthos collecting, hand-line fishing |
| 218 | Hydrographic section from Wakeham Bay to Lake Harbour | 61°51′ | 71°46′ | 137 | hydrographic |
| 219 | | 62°02′ | 71°25′ | at least 400 | hydrographic |
| 220 | | 62°14′ | 71°05′ | about 300 | hydrographic |
| 221 | | 62°12′ | 69°38′ | 274 | hydrographic |

LIST OF STATIONS—*Continued*

| Station | Map location | North Latitude | West Longitude | Depth (metres) | Type of station (work done) |
|---|---|---|---|---|---|
| 222 | south of Lake Harbour | 62°45′ | 69°41′ | 80-90 | plankton hauling, benthos (dredging) |
| 223 | near Station 222 | 62°43′ | 69°37′ | 20-75 | plankton hauling |
| 224 | Port Burwell, outer harbour | 60°24.2′ | 64°50.5′ | 18-60 | hand-line fishing, long-line fishing |
| 224A | Mission Cove, Port Burwell | 60°25.1′ | 64°50.8′ | — | littoral collecting |
| 225 | Button Islands, north of Mac-Coll Island | 60°40.5′ | 64°39.7′ | 22 | benthos collecting, hand-line fishing |
| 226 | Button Islands, east of Mac-Coll Island | 60°38′ | 64°38.9′ | 90-100 | plankton hauling, benthos (dredging) |
| 227 | Button Islands, south of Minto Anchorage | 60°35.9′ | 64°43.5′ | 0-20 | littoral collecting, hydrographic |
| 228 | southwest of Beacon Island, mouth of George River | 58°52′ | 66°28′ | 14 | plankton hauling |
| 229 | Adlorilik | 59°29′ | 65°17.5′ | 13-0 | plankton hauling, littoral collecting |
| 230 | Adlorilik | 59°30′ | 65°17.5′ | — | plankton hauling, hand-line fishing |
| 231 | Adlorilik | 59°28.5′ | 65°15′ | 63-90 | plankton hauling, benthos (dredging) |
| 232 | Adlorilik | 59°23′ | 65°01′ | 10 | plankton hauling, long-line fishing |
| 233 | Adlorilik | 59°30.5′ | 65°21.5′ | shallow | hand-line fishing |
| 234 | 10 miles west of Adlorilik | 59°31′ | 65°45′ | 82-90 | plankton hauling hydrographic |
| 235 & 51 | Pitulaksitik, between Whale River and George River | 58°29.5′ | 66°55′ | — | littoral collecting |
| 236 | off mouth of Koksoak River | —— | —— | — | sealing |

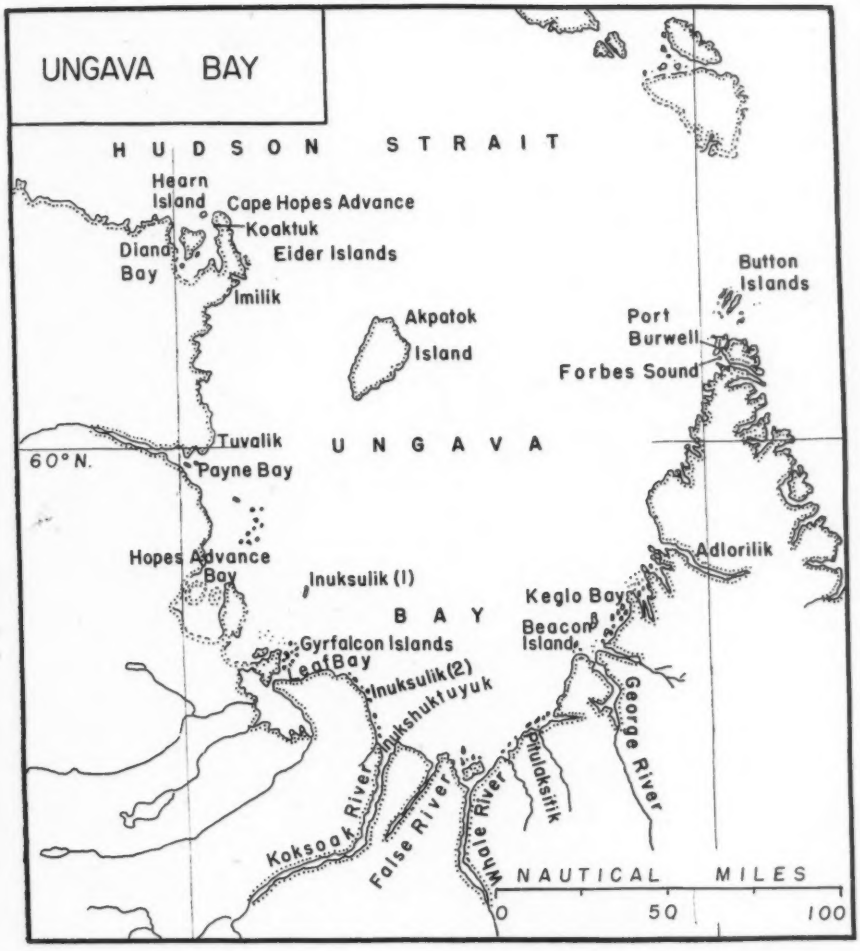
UNGAVA BAY
HUDSON STRAIT
Hearn Island
Cape Hopes Advance
Koaktuk
Diana Bay
Eider Islands
Imilik
Akpatok Island
Button Islands
Port Burwell
Forbes Sound
Tuvalik
UNGAVA
60° N.
Payne Bay
Hopes Advance Bay
Inuksulik (1)
BAY
Keglo Bay
Beacon Islands
Adlorilik
Gyrfalcon Islands
Leaf Bay
Inuksulik (2)
Inukshukfuyuk
George River
Pitulaksitik
Koksoak River
False River
Whale River
NAUTICAL MILES
0
50
100

FIGURE 1

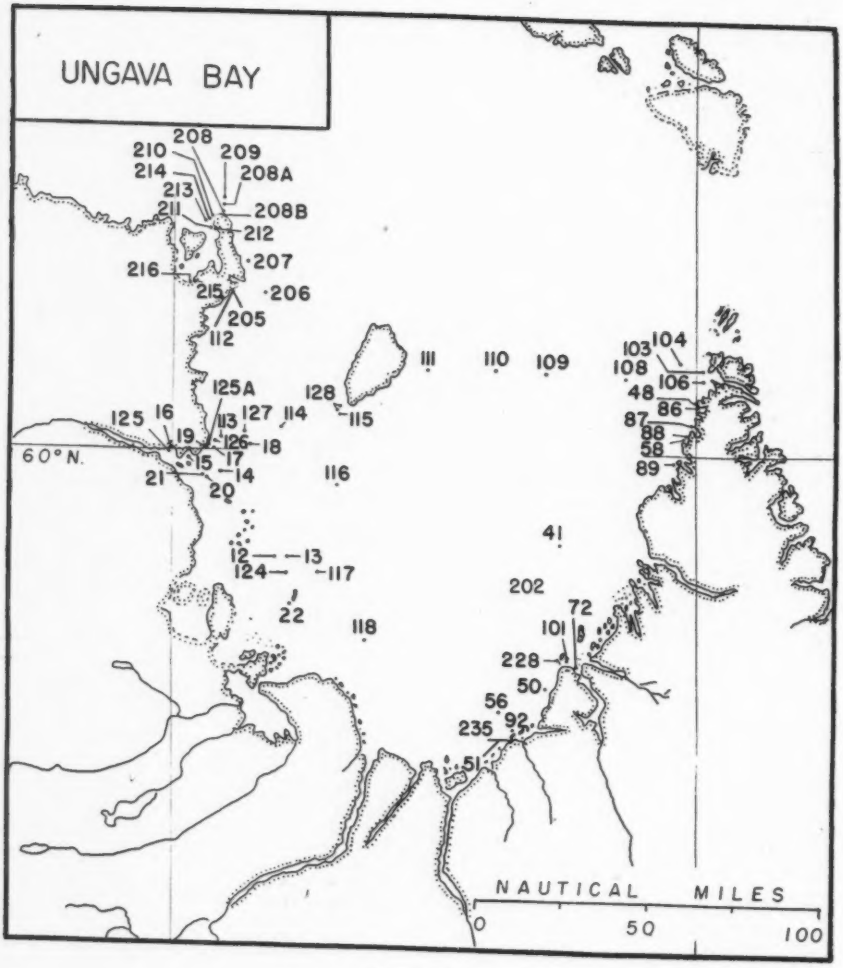
UNGAVA BAY
208
210
209
214
208A
213
211
208B
212
216
207
215
206
205
112
111
110
109
103
104
108
106
48
86
87
88
58
89
125A
128
115
125
16
113
127
114
19
126
18
60° N.
15
17
21
14
20
116
41
12
13
124
117
202
72
22
118
101
228
50
56
92
235
51
NAUTICAL MILES
0
50
100

FIGURE 2

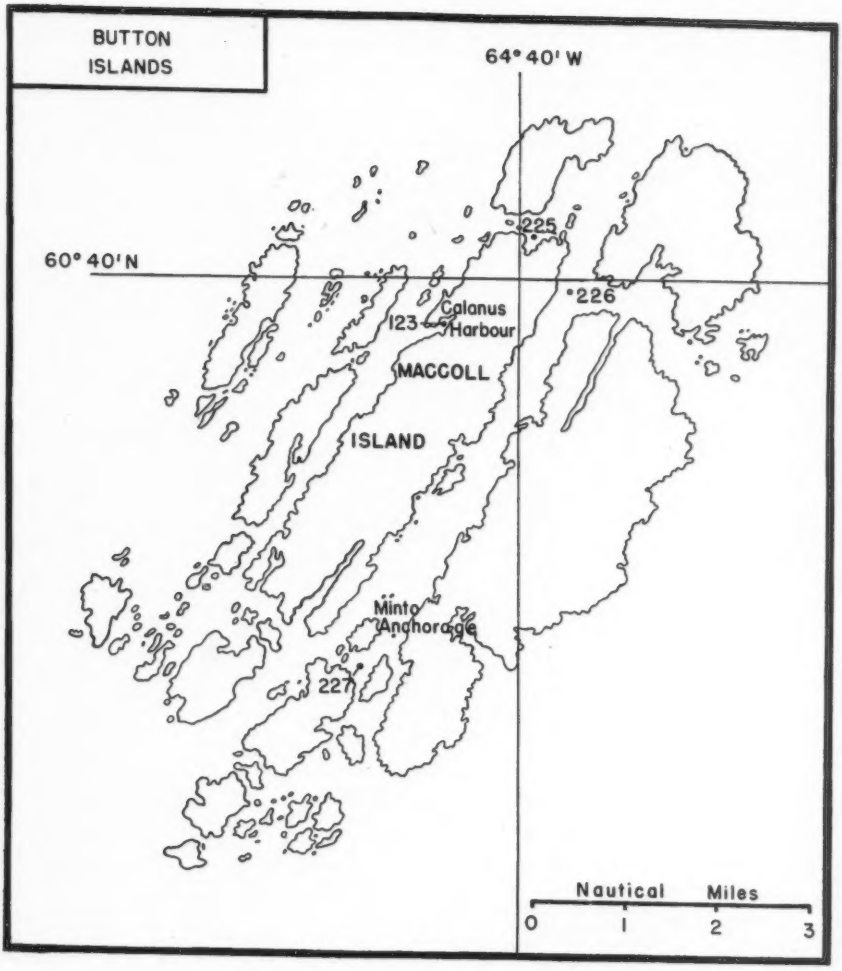
BUTTON
ISLANDS
64° 40' W
60° 40' N
225
226
123
Calanus
Harbour
MACCOLL
ISLAND
Minto
Anchorage
227
Nautical Miles
0 1 2 3

FIGURE 3


KILLINEK ISLAND
60° 30' N
BUSH ISLAND
Lenz Strait
81
62
79
80
Port Harvey
83
KILLINEK
ISLAND
Fox Harbour
82
Amittaq Inlet
Port Burwell
Jackson Island
85
Munro Harbour
61
64° 40' W
FORBES SOUND
Cape William Smith
78
71
76
75
75
69
Young Inlet
75
60
75
75
McLean Strait
NAUTICAL MILES
0 1 2 3 4 5

FIGURE 4

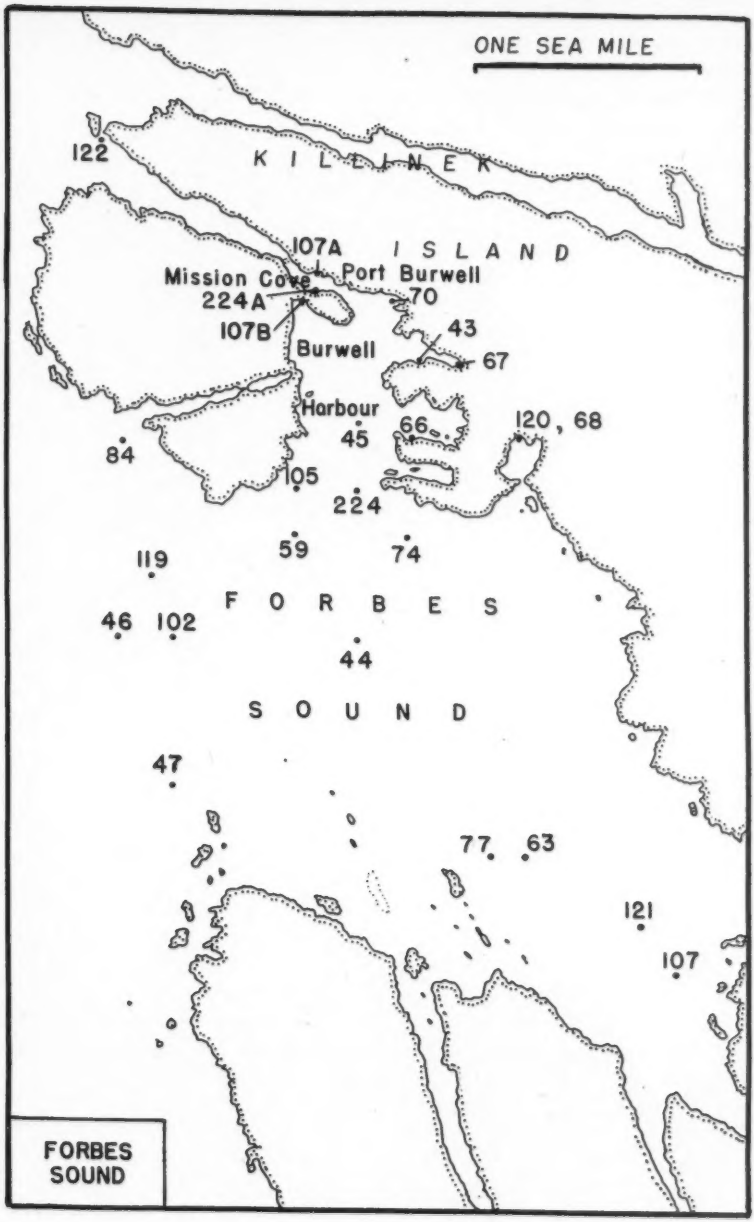
ONE SEA MILE
122
K I L L I N E K
107A
I S L A N D
Mission Cove
Port Burwell
224A
70
107B
43
Burwell
67
Harbour
66
120, 68
45
84
105
224
119
59
74
F O R B E S
46
102
S O U N D
44
47
77
63
121
107
FORBES SOUND

FIGURE 5

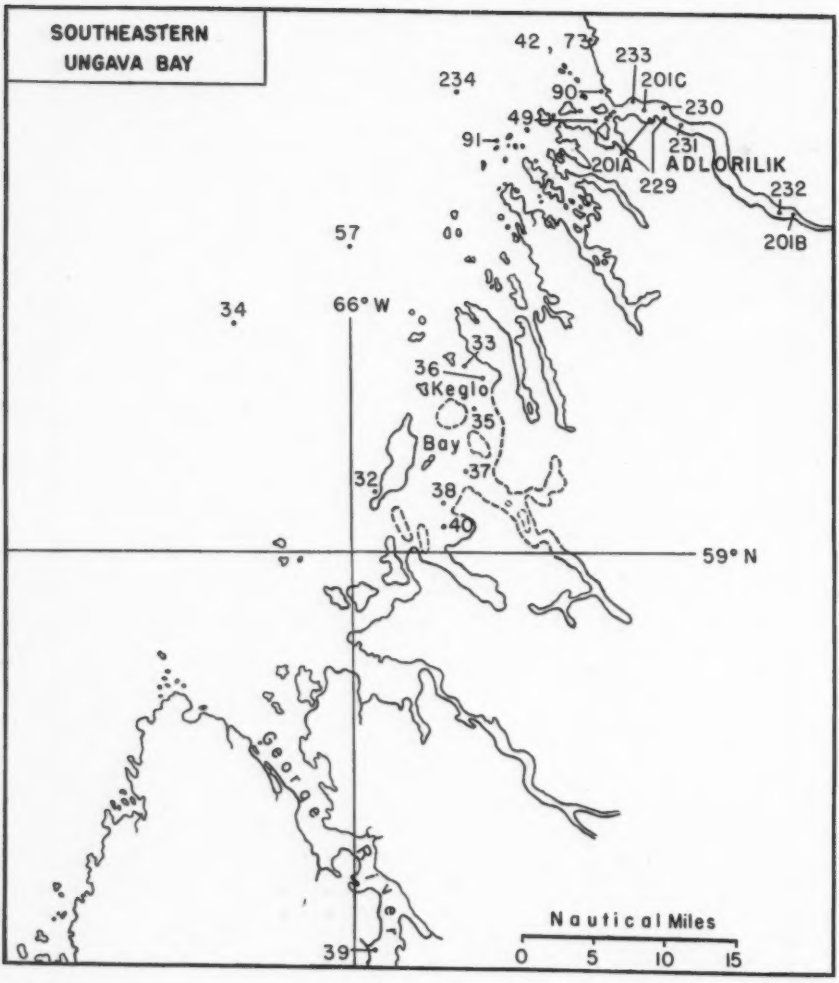
SOUTHEASTERN
UNGAVA BAY
42, 73
233
201C
234
90
230
49
91
231
201A
ADLORILIK
229
232
201B
57
66° W
34
33
36
Kegic
35
Bay
37
32
38
40
59° N
George
39
Nautical Miles
0 5 10 15

FIGURE 6

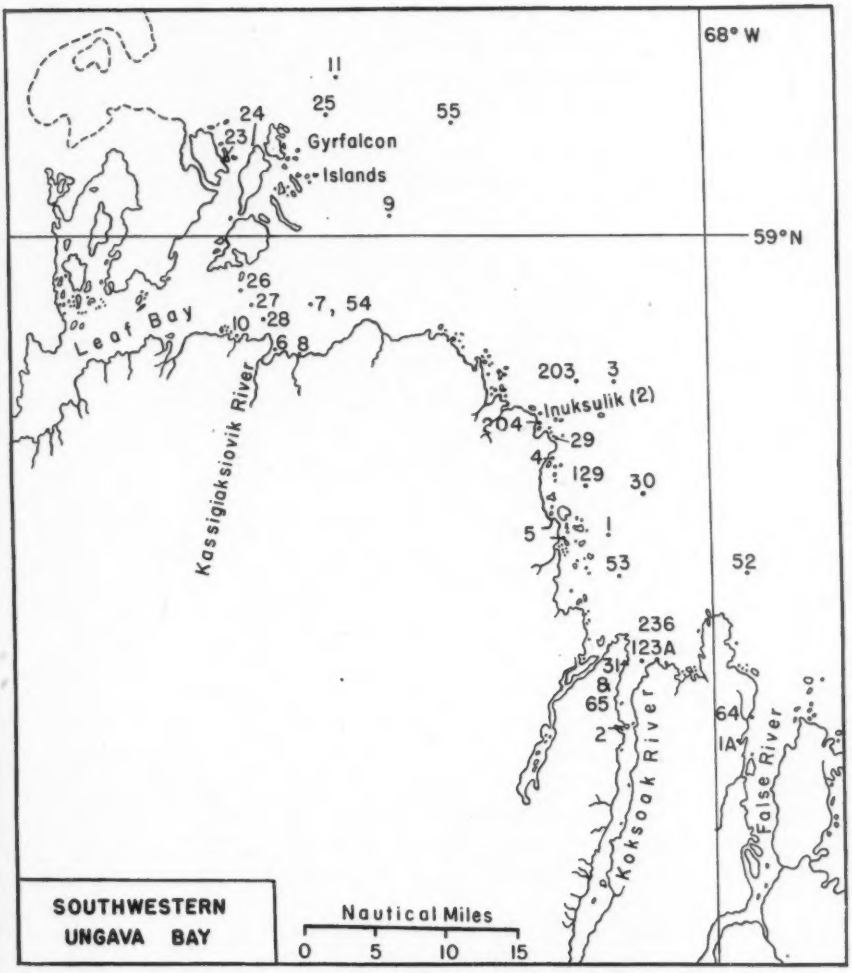
68° W
59°N
11
25
55
24
23
Gyrfalcon
Islands
9
26
27
7, 54
10
28
6
8
Leaf Bay
Kassigiaksiovik River
203
3
Inuksulik (2)
204
29
4
129
30
5
!
53
52
236
123A
31
8
65
2
64
1A
Koksoak River
False River
SOUTHWESTERN
UNGAVA BAY
Nautical Miles
0
5
10
15

FIGURE 7

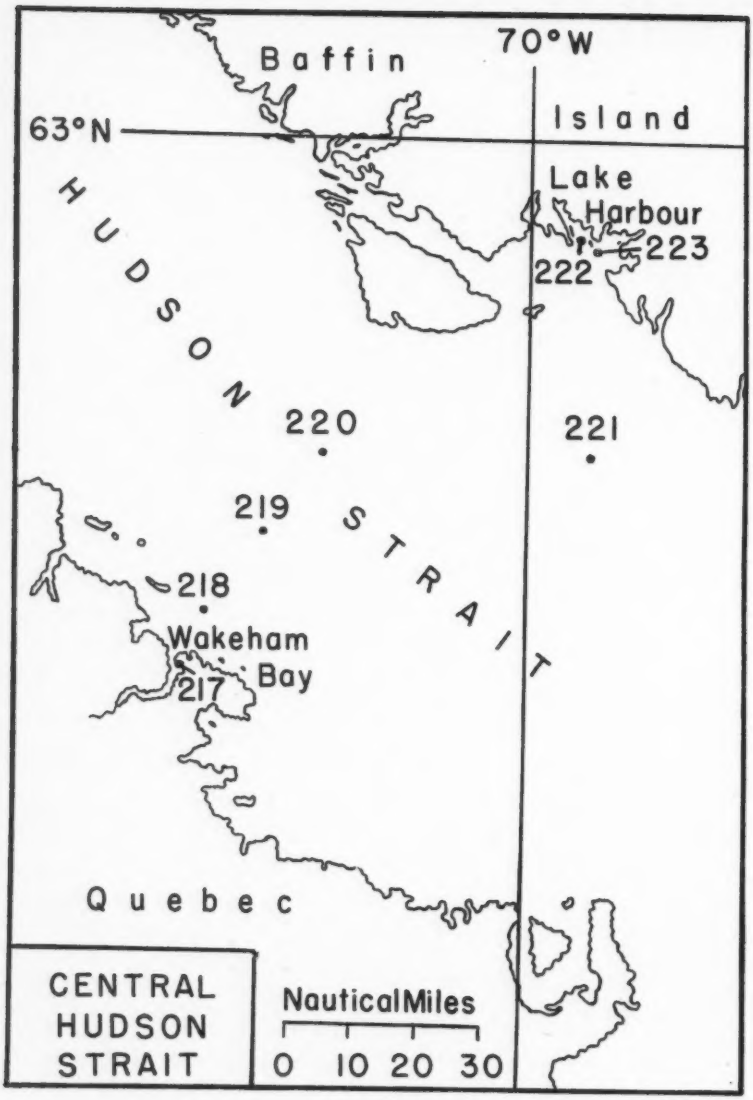
Baffin
Island
70°W
63°N
Lake
Harbour
223
222
HUDSON
220
221
219
STRAIT
218
Wakeham
Bay
217
Quebec
CENTRAL
HUDSON
STRAIT
NauticalMiles
0 10 20 30

FIGURE 8

# Contribution to the Study of the Fishes of Ungava Bay

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ABSTRACT

The aquatic environment of the Ungava Bay area and watershed is described. Forty-four species of fishes are recorded, belonging to twenty-one families. Twenty-nine are marine forms, two are anadromous, and thirteen are predominantly or entirely freshwater forms. Seventeen are new records for Ungava Bay, and a few are new for the whole of the Canadian Eastern Arctic. The marine piscine fauna is shown to be in the main subarctic, containing such arctic-subarctic forms as *Salvelinus alpinus, Reinhardtius hippoglossoides, Gymnocanthus tricuspis, Icelus bicornis, Aspidophoroides olriki, Lumpenus fabricii,* etc., and subarctic-boreal species such as *Salmo salar, Gadus callarias, Sebastes marinus, Liparis atlanticus* and *Mallotus villosus.* More strictly arctic species in the fauna are *Boreogadus saida, Triglops nybelini* and *Oncocottus quadricornis;* there are two Atlantic boreal species recorded, *Paralepis rissoi kröyeri* and *Lampanyctus crocodilus,* and the remainder are fishes of wide north-south range, found in all three zones (arctic, subarctic, boreal), such as *Somniosus microcephalus, Myctophum glaciale, Ammodytes dubius, Triglops pingeli, Eumicrotremus spinosus, Liparis tunicatus, Lumpenus maculatus, Lycodes reticulatus.*

## INTRODUCTION

In 1947, the Fisheries Research Board launched the eastern arctic marine investigations, based on two general terms of reference: (1) the investigation of the physical and biological oceanography of the eastern arctic region of Canada, and (2) the discovery and study of any marine resources which could be developed in the interests of the native population. The programme of research was placed under the direction of the senior author, and field work started in Ungava Bay.

The 1947 reconnaissance was carried out with the help of such boats as were available at Fort Chimo, a small 30-foot motor boat and a 40-foot Peterhead boat, native-owned. Both sides of Ungava Bay were studied by the present authors, from Payne Bay around to Port Burwell. The area covered was necessarily restricted by the inadequacy of the craft used, but nevertheless the season's work demonstrated the most fruitful lines of research for the future.

Hildebrand made a short visit to the Fort Chimo area again in March 1948, for a three weeks' study of the winter fishing in certain lakes, and of the species involved. In the summer of 1948, Hildebrand and P. A. Orkin, again in a Peterhead boat, studied sealing conditions in the western part of Ungava Bay,



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and spent the latter part of the summer in the vicinity of Port Burwell, collecting more material for the study of the Atlantic cod. During this season the new research vessel "Calanus", a 50-foot diesel ketch, was built in Nova Scotia, and was sailed up to Fort Chimo in August and September, to be beached for the winter.

The "Calanus" made possible much more extensive work than was attempted in the first two seasons. There were no geographic limitations on the waters studied, the ship being capable of working both at sea and in shallow inshore waters, and the equipment included trawls, and larger dredges than could be handled from the smaller craft. During this season the senior author was in charge of the field operations, assisted by E. H. Grainger. The station list for all this work has been published separately in this series (Dunbar and Grainger, 1952), and for all references in this present paper to stations and geographic locations, the reader is directed to that general station list.

The difficulties resulting from the inadequacy of the boats used in 1947 and 1948 need not be enlarged upon here. The available maps of Ungava Bay are very incomplete and often inaccurate, and there are not many soundings. Other limitations were placed upon the work by the short season at our disposal and by the very erratic climate of the area.

The first discovery of Ungava Bay by Europeans is in some doubt. Presumably information from Portuguese fishermen must have been responsible for a bay which appears on Mercator's map of 1569 and which is supposed to represent Ungava Bay. The first certain record of exploration in the vicinity of Ungava Bay is that of John Davis, (in 1587), who named Cape Chidley. The exact location of the Cape Chidley of John Davis is in dispute, but is now credited to several small islands off the eastern coast of Killinek Island.

Weymouth visited Ungava Bay in 1602, and Henry Hudson, having read Weymouth's journals, entered Hudson Strait in 1610. Ungava Bay was not mentioned for a number of years after Hudson, but undoubtedly many of the exploring parties which entered Hudson Bay passed Ungava Bay, and at times probably sailed into it. French fur traders penetrated far into the region, and a map published by Delisle in 1703 used the name "Baie du Sud" for Ungava Bay.

In 1811 two Moravian missionaries, Kohlmeister and Kmoch, sailed from Labrador into Ungava Bay, taking the treacherous route through McLelan Strait (Ikerasak). Many of the features of the eastern and southern portions of the bay were mapped and named by them. They ascended the Koksoak River at least as far as Fort Chimo, where they were well received by the natives. On their return to England, they described the region in enthusiastic terms, for it seemed to them very pleasant compared to the barren coast of northern Labrador.

No notice appears to have been taken of this report except by the Hudson's Bay Company, which took steps to open trading negotiations at Chimo. There is considerable confusion in the published dates of the first establishment of the first Ungava Bay trading post. According to Elton (1942), who had access to the company's files, a preliminary survey was made in 1828 by Dr. Mendry (or Hendry), who approached Fort Chimo overland from Richmond Gulf in Hudson

Bay. The post was established by Nichol Finlayson in 1830, but owing to difficulties in supplying it (the marine route still being largely unexplored), it was abandoned in 1843. In 1866 it was reopened, and supplied by the new vessel "Labrador". Of special interest to the present subject is the development of a commercial salmon fishery by the Hudson's Bay Company, starting in 1881 (see below). Other trading posts were later opened at Port Burwell, George River, Payne Bay and Leaf River. The Leaf River and Port Burwell posts have since been closed.

Collection of natural historical material, including fish, did not begin in Ungava Bay until the arrival of L. M. Turner in 1882. Lucien McShan Turner was sent to Fort Chimo by the United States Army Signal Service at the instigation of S. F. Baird of the Smithsonian Institution. Turner's instructions were to reside in the region, keeping weather data, making ethnological investigations and collections of animals and plants; in carrying out this programme he spent over two years, from August 6, 1882 to September 4, 1884, in and around Fort Chimo. The collections and material he brought home were very considerable, but only his ethnological work, and an abbreviated list of the birds recorded, have been published. His manuscript material, including some fifty pages on fishes, is deposited in the United States National Museum, and for the opportunity of studying this, and also for permission to publish all or part of it, the present authors are indebted to that institution. In the material presented here, Turner is quoted at some length on several of the species discussed.

The Canadian Government expeditions to Hudson Strait and Hudson Bay, in 1884, 1885 and 1886, under A. R. Gordon, visited Killinek Island and established an observation station at Burwell. Between 1892 and 1895, A. P. Low of the Geological Survey made explorations in the Ungava Peninsula, and in 1897 he explored the south coast of Hudson Strait from King George Sound and including Ungava Bay as far east as George River. There was little exploratory work from that date until quite recent years. Several small collections have been made by individuals on Government Patrol parties; in 1927 Frits Johansen visited Port Burwell as naturalist on board the "Larch", and Dunbar made marine collections during short visits at the same station (Burwell) in 1939 and 1940.

The total Eskimo population of the Ungava Bay district is small, probably somewhat under a thousand. In 1940, census figures showed 257 at Chimo, 357 at Payne Bay, and 203 at George River and Burwell, giving a total of 817 for that year. This population is normally scattered along the shores in hunting and fishing groups, and the census locations refer simply to the trading posts at which they obtain their supplies. The Indians at Fort Mackenzie, inland from Chimo, numbered about 180 in 1940. The Eskimo population appears to have been increasing steadily for many years.

The fishing activity of the native population is not great, and is restricted almost entirely to the Atlantic salmon and the arctic char. The problem of the development of a marine fishery in Ungava Bay, by and for Eskimos, will be dealt with in a separate paper in this series.

## LITERATURE

There is no publication dealing with the fishes of Ungava Bay alone. The earliest ichthyological reference to the area is probably that of McLean (1849), who lists trout, whitefish, suckers and salmon as comprising the fish fauna of the region. Davis (1854) adds the northern pike to this list. Robert Bell and A. P. Low, of the Geological Survey of Canada, have a number of references to fish in the reports of their investigations in the Ungava region. L. M. Turner mentions a few of the fish in his report on the ethnology of the region and in several short papers. His main work on the fish has never been published, as already mentioned above, and some of this manuscript material is used in the present paper. Kendall (1909) in working on his paper on the fishes of Labrador, became acquainted with Turner's collection in the U. S. National Museum, but Turner's manuscript with details of locality, abundance, etc., appears to have eluded his search. Kendall published the list of fishes in Turner's collection with the statement that Turner collected in the vicinity of Fort Chimo. One of the present authors (H.H.) finally unearthed the manuscript notes, and its use has allowed the correction of certain errors in the published distribution of some of the fishes.

Since Kendall's list in 1909, a few species of fish collected at Port Burwell by Johansen in 1927 have been recorded by Vladykov in his publication on the fishes of the Hudson Bay region (Vladykov, 1933). Legendre and Rousseau (1949) have recorded certain salmonids, suckers, sticklebacks and the northern pike from rivers flowing into Ungava Bay (George and Payne Rivers). Perhaps the most interesting record in this latter paper is that of a cyprinid, *Couesius plumbeus*, from a stream close to Indian House Lake.

## AQUATIC ENVIRONMENT

The watershed of Ungava Bay is vast and partially unexplored. Our knowledge of the fishes of the interior is limited to the writings of A. P. Low, who travelled in the area during the years from 1892 to 1895. Low used only common names for the fishes observed, such as salmon, whitefish, trout and suckers, and the difficult portages made the collection of fishes impossible. Dr. Jacques Rousseau made two voyages in recent years, down the George River in 1947 and along the Payne River in 1948, and was able to preserve small fish collections. L. M. Turner has some information of the fresh waters near Fort Chimo, and the present authors made collections of fresh-water fishes where possible during an essentially salt-water investigation.

Except for the limestone island of Akpatok, the terrain and watershed belong to the Canadian Shield, of a general low-lying topography to the south and west, with the mountains of northern Labrador to the east. Five major rivers drain into the bay; the Koksoak, George, Leaf, Whale and Payne Rivers, in that order of magnitude; and several lesser streams, the most important of which are the Mukalik, Tuktuk, Tunulik and Korok Rivers. The combined fresh-water contribution of these rivers is enormous, and must play a decisive part in lowering the salinity of the waters of the bay, at least in the upper layers.

The tree-line takes a somewhat unsteady course across this watershed. In the northern extremities of their distribution, the trees (dominated by tamarack and black spruce) are found only in the river valleys and in other depressions in the terrain. From the present inconclusive studies there appears to be a relation between the northern limit of trees and the distribution of fresh-water fishes, and there is also the suggestion that the limiting factor in several cases may be food supply rather than the direct temperature effect.

Frozen conditions on the lakes in the Fort Chimo area are prolonged. Frost may occur in any month of the year, and the freezing of the lakes takes place in late October or November. The ice cover was found to vary between 42 and 54 inches on the lakes visited by Hildebrand early in April 1948, and the variation appeared to be correlated inversely with snow cover. The ice on the lakes begins to melt in May, and the outlets open shortly after; but the ice does not disappear completely until the beginning of July. In 1948, several days of high wind broke up the ice on Lake Mendry near Fort Chimo earlier than usual, and the lake was free of ice by the 25th of June.

The duration of the snow cover varies considerably from year to year. Many of the hills and steeper slopes are bare of snow by the middle of May, but the snow persists in protected places well into July, sometimes throughout the summer. The snow falls again first in September. No glaciers form anywhere in the Ungava Bay drainage.

Hildebrand's work in March and April (March 21 to April 13) 1948 covered three lakes close to Fort Chimo. Lake Mendry (also called locally Whitefish Lake), Lac Berthet (Goudies Lake), and Lake Stewart, which is unnamed on Canadian charts. The proximity of these lakes to the settlement of Fort Chimo was apparently responsible for the reduction of the fish populations recorded. Details of methods used on this survey, and of the fish themselves, are given below.

The physical oceanography of Ungava Bay, shown by the present series of field studies, will be published in a separate paper. The salinities and corrected temperatures from the 1949 work are not available at the time of writing, but the 1947 results are sufficient to show the general nature of the water. Thus at station 41 (see station list, Dunbar and Grainger, 1952), on August 17, 1947, the following readings were obtained:

| Depth (m.) | T°C. | S ‰ | Oxygen (cc/l.) |
|---|---|---|---|
| 0 | 2.30 | 32.01 | 8.15 |
| 10 | 2.33 | 32.00 | 8.05 |
| 25 | 2.00 | 32.00 | 7.95 |
| 50 | 0.54 | 32.27 | 7.17 |
| 100 | –0.79 | 32.50 | 7.26 |
| 150 | –0.95 | 32.77 | 6.95 |
| 200 | –1.92 | 32.75 | 7.12 |

The very low temperature at 200 metres is remarkable and is comparable to the figures obtained in Hudson Bay in 1930 by Hachey (1931). Such low temperatures were not recorded in 1948 or 1949.

Temperatures were somewhat lower in the upper layers in the early part of the season, as is to be expected, and the salinities also were lower in June and July, showing strong coastal influence and the effects of melting ice. It is clear that the water of Ungava Bay is strongly affected by both these factors, and that temperatures are always low. The highest temperature recorded was in 1949, at station 114 on August 24, where the surface temperature was 5.80°C. In the matter of temperature, the waters of Ungava Bay lie between the strictly arctic conditions recorded from the Baffin Island coasts and the strongly subarctic waters of west Greenland, where the Atlantic influence is strong. It is doubtful whether any great Atlantic intrusion can be shown from the physical data alone, but the fact that the temperatures are not low enough to signify unmixed polar water, and the presence within the bay of the Atlantic cod (*Gadus callarias*), and the Atlantic salmon (*Salmo salar*), together form good evidence for Atlantic influence.

The western and southern portions of Ungava Bay are shallow, in general less than 100 metres in depth. In the eastern half of the bay depths of over 200 metres have been recorded, and in the extreme northeast, off Burwell, the water approaches 400 metres depth. Just outside the bay, west of the Button Islands, there is a sudden drop over a small area to 800 metres. The general pattern of the bathymetry is given by Dunbar (1951); more detailed information is in preparation. The bottom is muddy and rocky, and almost everywhere very uneven.

## METHODS OF COLLECTING

The fishes described here were taken by dredge, tow net, hand line, a few by long-line trawl and otter-trawl, and some by hand in the intertidal zone. Details of long-lining and otter-trawling will be published separately; neither method was found to be satisfactory in Ungava Bay. A 150-foot seine net was used for a short time in 1947, in Leaf Bay, but neither the fish population nor the terrain was found to be suitable for that technique. In the fresh-water work in the winter of 1947-48, Hildebrand used gill nets in the lakes near Fort Chimo, of four-, five- and six-inch mesh (stretched measure) and 8-feet depth. To thread these nets under the ice, a Lake Winnipeg "prairie jigger" was used, no doubt for the first time in that whole area. The native method is still the laborious procedure of digging holes in the ice every five to ten feet and pushing a pole from hole to hole to take the first line under the ice. The Lake Winnipeg method made a considerable impression on Hildebrand's Eskimo assistants and it is hoped that when suitable materials and facilities are made available to the natives, they will make their own jiggers. For a description of the method, see Sprules (1949).

The classification used here is taken from Jordan, Evermann and Clark's "Checklist of the Fish and Fishlike Vertebrates of North and Middle America" (1930) except where more recent revisions necessitate changes. The authors have followed especially A. S. Jensen, who has done so much excellent work on the fauna of Greenland waters. Eskimo names are given as well as the common

English names, where possible, using those applicable in the Ungava Bay dialect. An Eskimo name may well cover two or more separate species, sometimes because the Eskimos do not appear to recognize the differences, often because they are recognized as similar. The word "ogac" is used for all three species of cod found in the area, and there is apparently no recognition of specific difference. (This is in contrast to the Greenland habit, where three names are used.) On the other hand, "Miluiak" covers both species of sucker, but the Eskimos will tell you that there are two kinds to be found. The two sticklebacks are given the same name, and even such widely divergent forms as the arctic eelpouts and the fresh-water burbot are seen to have certain external features in common and are called "Shulupaoluk".

"Ekaluk" is used generically to mean any kind of fish, but is also used specifically to refer to the arctic char. There are often names for the different sexes and colorations of fishes, notably the char. No attempt was made to gather the large number of names applied to this species. "Ekralugak" and "Nutidilik" both seem to be used for the small, landlocked form, although the latter also has an age significance. As for the Atlantic salmon, the original native name appears to have been discarded. The Ungava Bay Eskimo now avers emphatically that the Eskimo name for *Salmo salar* is "salmon". The word "Kapisilik", or "Kavisilik", which in Greenland is used for the Atlantic salmon, is applied in Ungava Bay and on the Labrador to the whitefishes; it means in fact "the scaly one".

## ACCOUNT OF THE SPECIES

**Somniosus microcephalus** (Bloch and Schneider). Greenland shark; ekalukjuak

Atlantic, arctic and subarctic, extending south to Scotland, the Skagerrak, and Cape Cod. Represented on the Pacific side by a closely related, but apparently distinct, form (Bigelow and Schroeder, 1948). Common in Davis Strait and Baffin Bay, and along the whole of the west Greenland coast. In the Canadian arctic, information on its abundance is lacking, but there are indications that it is very common in certain areas. In Ungava Bay, two specimens were recorded by Turner (1885), one at the mouth of the Koksoak River, the other a few miles up the river, both entangled in salmon nets. These two specimens were identified by T. H. Bean and entered in the U. S. National Museum catalogue. The next record is that of Vladykov (1933), on the basis of a specimen collected at Burwell in October 1927, the teeth of which were preserved.

During the present Fisheries Research Board field work, sharks were recorded only at Port Burwell, apart from the reports of local residents. On August 5, 1948, a Greenland shark measuring 10 ft. 1 inch (3.35 m.) was washed up in the inner harbour by a spring tide, in a dying condition. In 1949, four shark were seen by the "Calanus" party, and two of them were landed. A fifth individual, apparently of the same species, was caught by a commercial vessel anchored in Burwell outer harbour, while jigging for cod. Of the four seen by the "Calanus", one was shot by Eskimos at the surface in a small salt

water lake, one was shot but lost in the Mission Cove anchorage, another was seen to break the surface in the outer harbour, and the fourth was caught on longline. The individual which entered Mission Cove was probably attracted by the blood and oil from some fifteen seals which the Eskimos were cutting up on the shore.

The Greenland shark is seen sporadically in various parts of the Ungava Bay coastal waters, but it is by nature a deep-water animal. These shark are occasionally killed off the mouth of Payne Bay, and they are known to be stranded sometimes at the mouths of the Koksoak, Korok, and George Rivers. At Burwell, they are reported by the natives as being very common during the time of the autumn migration of the harp seals (*Phoca groenlandica*) through McLelan Strait, when they are caught in seal nets and do considerable damage to the seal hunt. The same thing, in smaller numbers, is also reported from Wakeham Bay, on Hudson Strait, and shark have always been known to be fairly common at Diana Bay and Cape Hopes Advance.

The two shark landed at Burwell in 1949 measured 9 ft. 6 in. and 12 ft. 2 in. (3.12 and 4.00 m.). Both were males, but only the smaller individual had well-developed claspers. In the larger animal, the claspers were represented by small rudimentary nodules, and until the specimen was cut open and displayed normal testes and vasa deferentia, it was entered in the field note-book as a female. In reviewing the early literature of the Greenland shark, some corroboration for this abnormality was found. It is not mentioned by Bigelow and Schroeder (1948), nor by Jensen (1948), but Turner (1874) and Lütken (1880) found evidence for suggesting that the claspers in the Greenland shark were, or could be, very poorly developed. In a series of specimens examined by Jungersen (1899), on the other hand, (specimens of ventral fins detached from the body), a gradient of clasper development, in proportion to the size of the fin, was recorded, the largest extending some 5 cm. beyond the tip of the fin; and Jungersen concluded that "every idea of the Greenland Shark differing from other Sharks in only possessing rudimentary ventral appendages must be dropped". The present writers consider, however, that the matter must remain in abeyance and undecided at present, because both the 1949 specimens were outside the norm described by Jungersen. The smaller specimen had claspers extending considerably more than 5 cm. beyond the tip of the fin, yet the animal itself was only 9½ feet in length; and in the larger specimen the claspers were negligible. Unfortunately, exact measurements were not made; but there is certainly evidence for a considerable variation in the development of the claspers of the form known at present as *Somniosus microcephalus*. This is rendered the more possible by the fact that there is some reason to suppose, on the evidence of the type of egg found in this shark, that it is an oviparous form (Bigelow and Schroeder, 1948); it is not beyond the bounds of possibility that fertilization in this species may be external.

The food of the Greenland shark consists of fish and seal. In Ungava Bay, fish bones and the lenses of fishes' eyes were found in shark stomachs. One individual had eaten a flatfish not identifiable further. The only flatfish recorded by the present survey in Ungava Bay waters was the Greenland halibut, *Rein-*

*hardtius hippoglossoides*, in young stages only, and it is possible that the remains found in the shark stomach belong to that species. In one stomach the remains of a small seal were taken, including a piece of seal-meat of about five inches cube measure. In the same stomach were found numbers of large fish scales, varying in size up to 13 mm. on the greatest diameter, and considerably altered by enzymic or acid action. After consultation with Dr. Ernest Lachner of the U. S. National Museum, who thought the scales might possibly belong to *Macrourus berglax*, *Macrourus* scales were experimentally digested in pepsin and hydrochloric acid, and in hydrochloric acid alone. The digested scales so produced resembled very closely those found in the shark's stomach.

Although the Greenland shark is clearly active enough to catch and devour seals (Bigelow and Welsh, 1925), it cannot be described as a very fearsome animal, at least at the surface. It has been known by whalers to gouge out large pieces of the flesh of dead whales, as described by Scoresby (1820), but there seems little evidence for the statement by Jordan and Evermann (1896) that this fish is an enemy to whales, "biting out large masses of flesh from their bodies". Jensen (1925) comments on the surprising fact, a common experience in Greenland, that these sharks "can be hauled up from such a depth (abt. 250-400 m.) with a line no thicker than a piece of stout string, and killed from the Kyak with no other weapon but a knife".

Attached to the eye of the largest animal caught in the 1949 season was a large copepod ectoparasite, a female *Lernaeopoda elongata* (Grant), with the following measurements:

| | |
|---|---|
| Overall length | 60 mm. approx. (second maxillae, or "arms", much contracted) |
| Trunk plus cephalothorax | 22 mm. |
| Egg strings | 29 mm. |

These parasites, which are always attached to the cornea, appear to be very common on the Greenland shark (Grant, 1827; Wilson, 1915).

Samples of shark livers were preserved in brine, and later analysed by Dr. F. A. Vandenheuvel of the Experimental Station at Halifax, with the following results:

| | |
|---|---|
| Oil content | 60 per cent approx. |
| Refractive index (20°C.) | 1.47154 |
| Iodine number | 100 |
| Vitamin A content | 1805 I.U. per gram |
| Unsaponifiable material | 8.6 per cent |

In Greenland, the economic importance of *S. microcephalus* is considerable, but in the Canadian arctic no effort has hitherto been made to use this resource. The native shark fishery in Greenland began at the beginning of the last century, when the liver oil was purchased and sold; and in the present century the skins have also been marketed, and the meat, dried, used for dog-feed (Jensen, 1925). During recent decades the annual catch of shark by the Greenlanders has averaged about 50,000 animals (Jensen, 1948), in west Greenland. In Denmark Strait Norwegian fishermen carry on a commercial shark fishery whose pro-

duction of liver oil is about half as great as that of the native Greenland fishery on the west coast (Greenland Administration, 1944), and in very recent years these vessels are reported to be operating in Baffin Bay.

The fresh meat of the Greenland shark contains a toxin which is injurious to both men and dogs. When dried and mixed with a little shark or seal oil, it provides good dog-feed which has been used in Greenland for generations, but has not been used among the Canadian Eskimos. For a discussion of this toxicity, see Jensen (1948).

**Salmo salar** Linnaeus. Atlantic salmon; salmon

A north Atlantic species, ascending all suitable rivers in northern Europe, Iceland, and northeastern North America, south to France and New England. The Atlantic salmon is rare in Greenland, being known only from certain restricted points along the southwest coast, such as Kapisigdlit in Godthaab Fjord, off Ikerasak in the Sukkertoppen district and in Amerdlok Fjord near Holsteinsborg. According to Jensen (1939) this species is increasing in abundance in Greenlandic waters, reflecting the increasing Atlantic influence of recent decades.

The Atlantic salmon has long been known to occur in Ungava Bay, but the records, up to the time of Turner, were open to doubt, because there were no museum specimens and because of the wide confusion resulting from the fact that the vernacular name "salmon" is commonly used in the north for the arctic char (*Salvelinus alpinus*). Kendall (1935) considered that the occurrence of Atlantic salmon in the rivers of Ungava Bay was very unlikely, since it was known to be very rare or absent on the Labrador coast north of Hopedale. The species was first reported, by common name, by McLean (1849). Other authors contributing to our knowledge of the Atlantic salmon in Ungava Bay are Bell (1885), Turner (1885, 1889) and Low (1896, 1898 and 1899). Museum specimens are in the U. S. National Museum (collected by Turner), in the Royal Ontario Museum of Zoology (Dymond, 1941) and in the collection of the University of Montreal (Legendre and Rousseau, 1949).

The Atlantic salmon ascends the larger rivers of the eastern half of Ungava Bay between (and including) the George and the Koksoak. According to native reports, it is occasionally taken as a stray in the Leaf River, farther west. It is not known from the Payne River, in spite of Low's (1899) report that it is. Low's information in this instance was not first-hand, and like the report of Wakeham (1898) that "salmon" are to be found in Hudson Strait and along the Baffin coast, it is no doubt based on the arctic char. Turner (1885) also reported the Atlantic salmon from rivers west of the Koksoak, on native information, and described the Leaf River as containing "an abundance of Salmon and Trout". Since this again is second-hand information it must be regarded with considerable doubt, although it is by no means impossible that the Atlantic salmon was more widespread in the rivers of Ungava Bay than it is at the present day. At present, the western limit of the normal distribution of *Salmo salar* in Ungava Bay is the Koksoak River.

The spawning areas of the Ungava Bay salmon are not definitely known (see Low, 1898), but all of them lie within the tree limits. The time of the

beginning of the upstream migrations is very variable, between July 25 and the end of August in the Koksoak, according to contemporary observation and information. Turner (1885) recorded that the salmon arrived in the Koksoak River "seldom before the 24th of July and on several occasions as late as the 20th of August". The salmon run is thus very variable, both in timing and in numbers of fish. There is some evidence of two runs, or at least of two peak periods, the first run being composed of the larger fish. In 1947, the greatest run occurred in the first three weeks of August. In 1948 there was an almost complete failure of the salmon run in both the Koksoak and the George Rivers. There was an early run from July 25 to the end of the month, followed by a blank month in August. The reasons for this great variation are not known. Sometimes, as happened in 1948, there is a late run in September, never in large numbers.

Salmon stomachs examined at George River by the present writers were empty, in agreement with the general finding that the Atlantic salmon eats little or nothing while on the upstream migration. Turner (1885) states that specimens he examined contained species of fish, including *Boreogadus saida* and various sculpins. As these species are marine, Turner's specimens must have been taken in the estuary. Several salmon examined at George River were found to be heavily parasitized.

The Atlantic salmon is of some importance economically to the Eskimos of Ungava Bay; and the unreliability of the upstream run is therefore a source of considerable concern to them, for the salmon are used not only for immediate human consumption, but also for the all-important dog-feed in the winter, the fish being stored in drums and allowed to become tainted and finally frozen. The present annual catch on the Koksoak River (by Eskimos) probably varies between about 12 and 40 barrels (one barrel equals approximately 300 lbs. of fish). The native catch in 1947 was estimated at about 35 barrels, in 1948 less than 14 barrels. The George River catch was approximately the same in 1947 as on the Koksoak, but in 1948 less than five barrels were obtained. The fish are taken in gill nets.

Commercial fishing for the Atlantic salmon of Ungava Bay was undertaken by the Hudson's Bay Company from 1881 onwards; this is the only sustained commercial fishery which has existed in the eastern arctic waters. When Lucien Turner visited Chimo in 1882 the fishery was in full swing on the Koksoak River. Gill nets of six- and six-and-a-half-inch mesh were used, set at some ten fishing stations between Chimo and the sea. During the first four years of the fishery a small refrigerator ship, the "Diana", was used to take the salmon to England, the vessel being equipped with a dry air freezing plant and able to store about fifty tons of fish. Later it was found cheaper and more profitable to salt the salmon for transportation. According to Turner, the yield for the first four years (during most of which Turner was at Chimo) was as follows:

1881 40 tons approx.; average weight 19 lb.
1882 24 tons approx.; average weight 16 lb.
1883 38 tons approx.; average weight 14.5 lb.
1884 less than 40 tons; average weight 14.7 lb.

The output of the fishery varied not simply because the abundance of fish varied, but because the number of men working was not constant, nor the number of fishing stations operated. The fishery has never been large, and grew consistently smaller as the years went by. It will be noticed that in the first four years the average weight of the fish dropped considerably.

In 1884 a similar fishery was opened on the George river, and also on the Whale River. In 1896 Low wrote that the salmon catch averaged 100 tierces on the Koksoak, 50 tierces on the Whale River and 120 tierces on the George. (The tierces were probably of about 300 lb. each.) The take from the Koksoak was thus already down considerably since the beginning of operations. Four years later, Low (1899) reported that the salmon fishery had steadily declined and that in 1897 it had been almost a total failure. From the scattered records available for the later years, it is apparent that the output continued to decline, and the fishery was finally given up in the early 1930's.

**Cristivomer namaycush** (Walbaum). Grey trout, lake trout

In fresh water from northern New England to the Great Lakes; across Canada to British Columbia, and common north to the limit of trees at least; known also from the barren grounds south of Hudson Strait. The precise northern limit of distribution is not known. Anderson (1913) records this species as common in the larger lakes of northern Alaska and east to Coronation Gulf. Pfaff (1937) reports specimens from King William Island and Baker Lake. Manning (1942) records a separate specimen taken on Southampton Island, and suggests the possible occurrence of the lake trout on Baffin Island.

In the Ungava Bay region the lake trout is very common in the larger lakes and streams. Turner (1885) reported it from the Koksoak River, Whitefish Lake (Lake Mendry) and Goudie's Lake (Lac Berthet), all in the vicinity of Chimo. Hildebrand obtained this form by jigging through the ice on Lac Berthet during April 1948, in depths of about fifty feet. Two more specimens were taken in gill nets set under the ice in the outlet of Lake Stewart in eight feet of water. These two specimens are in the McGill University collection.

Mr. B. M. May, manager of the trading post at George River, informed the writers that lake trout were very common in the lakes of the George River area. This is further supported by the field notes of Dr. Jacques Rousseau, who traversed the length of the George River by canoe in 1947. His notes include lake trout taken on the George River at Rapide Raciot, Ruisseau Coomis, Indian House Lake, and near Hades Hill (Legendre and Rousseau, 1949).

The present writers were unable to determine the northern limits of the lake trout in the region east of Ungava Bay. One native Eskimo at Port Burwell stated emphatically that they do not occur on Killinek Island or near McLelan Strait. On the west side of Ungava Bay, Flaherty (1918) found the lake trout common in the Leaf River drainage. Rousseau obtained it in Payne Lake and from the outlet of that lake in 1948 (Legendre and Rousseau, 1949). No definite records are available for the country north of Payne Lake, but it is to be expected that this species occurs in all suitable lakes and streams to Hudson Strait.

The lake trout is the largest known fish occurring in the region (with the exception of the Greenland shark). There are reports of individuals up to 100 lb. in weight, which are not necessarily true. One Eskimo, Joby White from Chimo who is a little under five feet tall, told the writer that he had caught a lake trout that was taller than he, by jigging through the ice. The largest fish reported in the literature from the Ungava Bay region weighed only 45 lb. The largest taken by the (junior) writer was only 60 centimetres long; but the area fished was already considerably fished by the native population.

In the Ungava Bay drainage, *Cristivomer* is found usually in the deeper water of the larger lakes. It appears the most reluctant of the trouts and chars to enter salt water. Weed (1934), however, states that in the region of Nain, in Labrador, the lake trout is occasionally taken in the sea. Native reports in Ungava Bay indicate that an occasional one is taken in brackish water in the George and Koksoak Rivers, but we obtained no definite statement that the lake trout are ever taken in the salt water of Ungava Bay.

Many writers have remarked on the voracious carnivorous habits of this species. The food of the adult is almost entirely fish. In the Fort Chimo area ciscos, whitefish and suckers have been found to be common food. May (personal communication) reports that mice and shrews are quite often found in the stomach of the lake trout, and it is quite possible that during periods of abundance the small mammals play a significant part in the diet of the fish.

The lake trout has considerable economic importance to the native population. Comparatively few are caught by the Eskimos, but it forms a large and important part of the fish diet of the Naskapi Indians, who catch them both by hand line and in gill nets. Large specimens are apt to damage the nets, and some lakes in the Indian area are not fished with gill nets for this reason. As for the Eskimos, the greater part of the lake trout fishery is carried on in the fall, after the snow cover has provided a highway to the lakes. Some few are taken in gill nets set for whitefish, but the majority are caught by jigging with hand lines. The hand-line fishing is done through the ice both in the fall and in the spring in the Ungava Bay region, very little during the middle of winter. It is done chiefly by the women and boys, especially the former, very often by the old women only. Fish taken after spending all winter under the ice are in poor condition; Turner reported that they have a disagreeable taste in the spring of the year.

**Salvelinus fontinalis** (Mitchill). Brook trout, speckled trout; anuk

Eastern North America from the colder streams of New England (and in mountain streams as far south as Georgia), west to the tributaries of Lake Superior and north at least as far as the Severn River on the west side of Hudson Bay; on the eastern side of Hudson Bay, known at least as far as about 24 miles north of Great Whale River. In the Ungava bay drainage, known from the Payne River and the George River, and rivers in between.

This species was first reported in our area by Turner (manuscript, 1885), from George River and Fort Chimo. The first published record of this species

from the tributaries of Ungava Bay, is that of Kendall (1909). During the 1947-49 field work, it was collected from the vicinity of the trading posts at Chimo and George River. Its northward limit was not established. It is known to be common from George River on the east to Leaf River on the west; in other words it is reported or recorded as common in all streams flowing for the most part through timbered country. From native reports, it is not found on Killinek Island, Burwell, nor was it collected there by the writers. Hantsch (1908) identified small salmonids at Burwell as S. *fontinalis*, but it is almost certain that the fish in question were S. *alpinus*, probably landlocked. The most northerly reliable record in the whole area is that of Legendre and Rousseau (1949), on a specimen obtained in Payne Lake.

Small specimens were obtained from Blueberry Creek, near Fort Chimo, and there is apparently a permanent population in that stream, which is not ascended at all by the arctic char. In the Koksoak River itself, and in the lakes of the Chimo region, speckled trout up to 10 lb. in weight are not uncommon, according to local information. On the George River, specimens were taken in Bobs Lake, in the small tributary streams, and throughout the outlet from Bobs Lake to the tidepools of the George. The outlet of Bobs Lake is a rocky, fast-flowing stream with one waterfall of about twenty-five feet. A minnow trap set immediately at the top of the falls captured small specimens of *fontinalis*, and it is probable that the population below the falls is augmented by individuals spawned in the lake. Specimens up to 22 cm. in length (total length) were taken at the foot of the falls, together with numerous arctic char (*alpinus*). The speckled trout apparently spawn in the lower portions of the outlet stream, while the char do not. Gonads observed during the latter part of August 1948 were nearly ripe; it is probable that spawning takes place in September or October.

In Bobs Lake small specimens of the speckled trout were very common in the shallows near shore; they were extremely shy and sought shelter under the stones which lined the shallow-water area. Three small individuals of 12, 12 and 14 cm. total length, with gonads approaching maturity were taken in a shallow tributary hardly two feet wide on August 29, 1948.

Some of the trout go to sea in the Ungava Bay area, although every stream visited in the southern part of the bay apparently had its permanent population as well. We have seen specimens taken at MacKay's Island, a region of definitely brackish water near the estuary of the Koksoak River. According to May (personal communication), the brook trout are taken in gill nets set for arctic char during the spawning run of the latter. There appears to be no definite separation between the runs of the two species, and the catch is usually a mixed one, with the arctic char in the great majority.

Very little is known of the food habits of this form on the northern edge of its range. The small trout in Blueberry Creek were feeding mainly on insects. Specimens approaching maturity in the lower part of the outlet from Bobs Lake (George River) were found to have empty stomachs. Larger fish feed mainly on other fish; shrews and other small mammals have occasionally been reported from their stomachs.

The economic importance of the speckled trout in the Ungava Bay drainage is not great, being largely displaced by the more desirable arctic char. Turner (1885) describes how brook trout were taken in some numbers after freeze-up when they congregate in the deep holes of the streams, where they can be easily hooked or speared. Similar accounts are given of the present day. The brook trout are also taken, as mentioned above, in gill nets used primarily for arctic char and for whitefish.

**Salvelinus alpinus** (Linnaeus). Arctic char; ekaluk

The alpinoid group of chars has been a source of puzzlement to taxonomists, owing to its great plasticity. They show great variation in colour and form, depending on locality, age, sex and sexual maturity. A large area of their distribution lies north of the region commonly visited, and there are many early descriptions which are incomplete and which come from localities in which no subsequent collecting has been done. In this present work, no intensive taxonomic study has been attempted, the writers preferring to wait until more material is available from a larger range, so that the limits of variation, if at all discernible, can be the better delineated. The confusion of the scientific terminology is not helped by the variety of vernacular names applied to this species, which has even led in the past to unwarranted extension of the published range of other salmonids, such as the Atlantic salmon. The arctic char is known commonly as "salmon", "arctic salmon", "Hearne salmon", "salmon trout" and "sea trout", all of which names should be abandoned. Eskimo names are also variable, depending on the maturity and sexual differences of the fish.

The arctic char is circumpolar in distribution, with its greatest abundance north of the tree-line. In arctic America it ranges very probably to the extreme northern limits of land. The northernmost record is from Floeberg Beach on the north coast of Ellesmere Island (Gunther, 1878).

In Ungava Bay and its drainage, the arctic char occurs in all suitable lakes and rivers. In the southern part of the region it is replaced in some of the smaller streams by the speckled trout. It occurs all along the coast in salt water at least during the spring months. There are many streams which contain populations apparently landlocked, which do not migrate to the sea, and which mature at a very small size. The writers measured specimens of the arctic char over a wide size-range, from these small landlocked individuals reaching maturity at lengths of 8 and 10 cm., up to sea-run fish of over 60 cm. The largest specimen measured was 69 cm. fork length. Spawning individuals in the outlet of Bobs Lake (George River) ranged from 25 to 50 cm. The native fishery obtains fish largely in the weight range of 2 to 8 lb. (1-4 kg.), but larger specimens are reported by the natives—over 20 lb. on occasion. Yessipov (1935) records an individual weighing 16 kilograms from Novaya Zemlya.

Observations on this fish during the present series of expeditions were limited owing to preoccupation with marine work. The char were studied briefly at two stations—at Burwell, and George river. One specimen was caught through the ice in March 1948 near Chimo (see below), a few were collected at Chimo itself, and two small landlocked specimens were collected by Father Steinmann,

of Koaktuk (Koartuk) at Cape Hopes Advance, and very kindly shipped to the present authors for study.

Port Burwell is situated on Killinek Island, which is separated from the mainland of the Labrador by the turbulent McLelan Strait, or Ikerasak. It is a bleak and barren island cut by sharply defined valleys and hills and with a cold and foggy climate which does not encourage vegetation. Most of the exposed rock belongs to the Canadian Shield, and is mostly gneissic. The char were collected from two small lakes connected by an impermanent stream, lying about one-quarter of a mile north of Burwell itself. These lakes, measuring approximately 450 by 150 yards and 250 by 100 yards respectively, have extensive shallow shorelines and are nowhere deep; the upper lake was found to be five feet deep in the centre, and the lower lake, though not measured, is reported by the Eskimos to be almost as shallow. The outlet from the lower lake is a small stream which enters the Burwell inner harbour over a fall of about eighty feet. One large glacier erratic of limestone was found in the drainage area, and limestone pebbles on the shore are not uncommon. The water in the lakes remains very cold throughout the year. The area draining into them usually has snowbanks on it until late in July.

Commercial minnow traps, set in narrow inlets among the sedge and sphagnum moss, were very successful in catching the char. One trap set in the connecting stream between the two lakes caught 33 small char which were approaching spawning condition. Although no direct observations on spawning were made, it is possible that there is an upstream movement in summer in these landlocked populations. At Burwell, spawning most probably occurs in the upper lake, for there are no permanent tributary streams suitable for spawning.

Specimens were taken between July 28 and August 16, 1948. They ranged in length (fork length) from 54 mm. to 170 mm.; nearly all of them were approaching sexual maturity and all of them retained their parr markings. The males showed a reddening of the ventral and anal fins, and a slight reddish wash to the belly. The smallest male measured 54 mm. and had advanced gonads. Females of lengths from 65 to 170 mm. contained ovaries in process of maturing. The largest female had indistinct parr markings, and the belly was a golden yellow in colour.

The following fecundity counts were made on three specimens taken at Burwell in August 1948. Lengths are fork lengths measured after the specimens had been preserved in formalin for one year. The size of the ova (formalin-hardened) was approximately 4 mm.

| Date | Length (mm.) | Number of eggs in right ovary | Number of eggs in left ovary |
|---|---|---|---|
| August 7, 1948 | 88 | 12 | 5 |
| " 7, 1948 | 95 | 15 | 9 |
| " 16, 1948 | 82 | 14 | 7 |

Two small specimens of char were obtained from a stream beside the Mission at Koaktuk, Cape Hopes Advance, through the good offices of Father Steinmann. These are known to the Eskimos as "Ekralugak", and may or may not be landlocked. The suggestion that they are landlocked is supported by the fact

that the ovaries (both specimens are females) are in process of development to maturity at a very small body-length. They measure 125 and 110 mm., fork length, the larger specimen with eggs up to 3 mm. diameter, the smaller one with eggs considerably smaller, about 1 mm. diameter. They were taken on July 25, 1949, so that the smaller egg-size is in keeping with the August condition already described for Burwell. The right ovary of the larger specimen contained 75 enlarged eggs (up to 3 mm.), and about 70 smaller cells, white and undeveloped. The left ovary was smaller, as in the Burwell specimens.

The char were also observed and collected in the outlet stream from Bobs lake, close to the George River trading post; the stream runs into the George River itself. Bobs Lake is not named on any chart of the region; the Eskimos call it Tessialuk, which is the name usually given to all lakes of this size. The lake drains over a fall about twenty-five feet high, which acts as an effective barrier to the migration of fish into the lake from below. We have specimens of brook trout, S. *fontinalis*, and sticklebacks, *Gasterosteus aculeatus*, from Bobs Lake, and the lake trout, *Cristivomer*, is known to live in it. No arctic char have ever been taken from the lake, but they are common during the summer run in the stream below the waterfall.

The char enter this stream, which is little over half a mile in length, during the latter part of July in most years. In 1949, they did not arrive until early in August, some time after August 2nd. In 1948 they were already plentiful when Hildebrand arrived at George River on July 25th, and the gonads were almost ripe. The char are found in the pools immediately below the falls, and also at times in the lower parts of the stream. Spawning, which presumably must take place, has not been witnessed either by the present writers or by the local residents. According to local information, the char leave the stream in the middle of September.

Thirty-five char from this stream were examined in 1948 for food and parasites. They ranged in total length from 35 to 50 cm., with an average about 45 cm. All the stomachs were empty, and parasites were not abundant. A few nematodes were taken from the region of the pyloric caeca. Parasitic copepods in the mouth and gill region are not uncommon. Turner (1885) records taking tapeworms from the intestines of char, the parasites being described by Leidy (1885).

Over the greater part, if not all, of the geographic range of the char, the upstream migration appears to take place in late July and during the month of August. No attempt is made here to summarize the information on this point, the whole question of the biology of the char being reserved for a separate publication. The following quotation from Turner's unpublished manuscript (1885) concerns the Ungava Bay char as such, and is therefore inserted here:

> At Ft. Chimo these fish begin to ascend the river (Koksoak) about the twenty-fifth of July, rarely earlier; and occasionally as much as twelve days later. At the beginning of the "run" but a few fish will appear and be greatly augmented in number in the course of three or four days. The "run" as it is called lasts from eight to fifteen days, decreasing as it increased with about four days in which the fish are plentiful.
>
> These trout ascend the rivers until they come to suitable spawning beds. I have seen them over a hundred and ten miles up the river. Beyond the falls they cannot ascend as here is

a perpendicular wall of over forty feet, over which rushes a tremendous torrent of water. They are known to ascend the Larch or North river, a tributary of the Koksoak, affluent at about 110 miles from the mouth of the latter river, to a great distance.

Of the winter biology of the char, very little is known. Very little information was gathered during the winter visit to Chimo in 1948. Only one specimen was obtained, hooked through the ice on a hand line in eight feet of water. It had been feeding on fish, which were too badly damaged for identification. Very few char are taken from the lakes in the vicinity of Fort Chimo during the winter, but a number are taken in the George River area, in gill nets. The natives say that their best catches are on brief moonlight nights. It is the local opinion that the char are largely inactive during the winter in fresh water, and it is also reported that they commonly have fungal growths on the skin, and that they are usually in very poor condition.

The sea-run fish live mainly on amphipods and on fish. In the Ungava Bay area the common amphipods *Gammarus locusta* and *Pseudalibrotus littoralis* probably form the bulk of the diet. Landlocked individuals are reported to feed on "Komuks" (insect larvae), sticklebacks, and smaller specimens of their own kind.

The economic importance of the char is considerable, to the Eskimos, wherever it occurs. During the upstream run, the numbers of fish present in the streams is impressive. Ross (1835) reported the taking of 3,378 fish, with a total weight of six tons, with a small net at the mouth of a single stream on Boothia Peninsula. From the little we know at the moment about the growth rate and powers of reproduction and recovery of the char, it is most probable that fishing on such a scale as this would very soon jeopardize the population of a stream. Even on the normal Eskimo scale of fishing, streams may become seriously depleted and require a rest for some years before the numbers are restored.

The char is the most important food fish of the Arctic Eskimo, except for populations living in the Mackenzie basin, who rely on whitefish, and the west Greenlanders who depend on Atlantic cod. In west Greenland, however, the char is an important secondary fish food in season. It has been shipped commercially from Greenland in small quantities since 1930, and commercial fishing for char was carried on in Frobisher Bay, Baffin Island, in 1947, 1948 and 1950. In Ungava Bay a few char were salted and shipped to England for a number of years. There seems to be little doubt that a commercial fishery concentrated in one locality can do serious damage to the char population. On the other hand, by spreading the effort over areas which are at present hardly fished at all, the char fishery might well be developed considerably as an Eskimo enterprise.

**Leucichthys artedi** (LeSueur). Cisco, tullibee, lake herring; kapisilik

Widespread in Canada, from the Great Lakes north at least to Great Bear Lake; ranging east to Coppermine River, Baker Lake and Fort Chimo. Pfaff (1937) identifies a coregonid fish from King William Island as *Argyrosomus tullibee*, which may belong to this species.

Three specimens of the cisco are known from Ungava Bay. Two were taken from a lake trout stomach in Lac Berthet by Turner (1885), and the other was

caught in Stewart Lake by gill net set in eight feet of water near the outlet, in 1948 (Hildebrand). Stewart Lake, two miles west of Chimo, is unnamed on current charts. This latter specimen, now in the McGill University collections, measured 181 mm. total length (to the tip of the tail in a natural position). Scale readings gave an age of 6+ years, indicating a growth rate very considerably less than the rates recorded in this species for Hudson Bay (Dymond, 1933), where the average fork length at this age was 335.3 mm. The gill-raker count was 40 (upper arch 15, lower arch 25). The colour in life was dark blue above and silvery below.

Nothing is known of the biology of the cisco in the Chimo region. Neither the native nor the white population distinguish between the Coregonids found there. It does not appear to be at all abundant. The present writers found only one specimen out of over sixty Coregonids, and L. M. Turner, who probably saw several hundred individuals of this group, obtained only two specimens of *L. artedi.*

**Coregonus clupeaformis** (Mitchill). Whitefish, common whitefish; kapisilik

Extends over almost the whole of the mainland of Canada east of the Rockies, except the maritime provinces. Known from the Yukon, the mouth of the Mackenzie and the arctic mainland coast, Baker Lake, Chimo and Ungava generally; south to the Great Lakes. In Ungava Bay, judging from the collecting by the writers and observation of native catches, this is the most common coregonid. It is common in most of the streams and lakes within the tree-line, from Leaf River on the west to George River on the east. The northward extension was not determined. One Eskimo from Fort Chimo reported that north of the tree-line a few small individuals of "whitefish" (species not specified) were taken as far north as Hopes Advance Bay, on the west side of Ungava Bay, but that beyond that point they were unknown. No definite record was obtained of their occurrence in the Payne Bay area; the natives do not regularly fish in that region. One Eskimo report had it that whitefish used to be taken in small numbers in a lake near Cape Hopes Advance. Rousseau took no specimens of whitefish during his traverse of western Ungava along the Kogaluk and Payne Rivers (Legendre and Rousseau, 1949).

For the precise identification of the Ungava Bay specimens, the writers are indebted to Dr. Dymond and Dr. Scott, of the Royal Ontario Museum of Zoology. The material appears to be identical with that for the Great Lakes specimens. Gill-raker counts from nine specimens taken from Goudies Lake (Lac Berthet on the Canadian chart) during April 1948 are given here, the fish themselves being now in the McGill University collections:

| Number of fish | Upper arch | Lower arch | Total |
|---|---|---|---|
| 1 | 10 | 15 | 25 |
| 4 | 9 | 17 | 26 |
| 1 | 8 | 18 | 26 |
| 1 | 10 | 16 | 26 |
| 1 | 10 | 17 | 27 |
| 1 | 9 | 18 | 27 |

These specimens were adults of from 45 to 50 cm. total length, taken in gill nets of 3- to 5-inch mesh, over muddy bottoms in depths varying from 16 to 56 feet. The nets were laid near a conspicuous landmark from which the lake gets its native name Ninaoyuk ("like a nose"), and which is approximately 600 feet in height.

A large number of the whitefish stomachs examined during March-April 1948 were empty, which may well have resulted from a prolonged stay in the gill nets. Five stomachs were crammed with food consisting chiefly of chironomid larvae, fish eggs (*Catostomus*?), small gastropods and pelecypods. Chironomid larvae made up the major portion of the food. The fish were taken under an ice cover approximately four feet thick, and the fine condition of the fish themselves would indicate regular feeding during the winter, which is not surprising considering that there are only some three and one-half months in the year during which the lakes are free of ice. In the outlets from the lakes, open water exists from June to the end of December, but the months of total open water are July, August, September and part of October. The condition of the whitefish was much better than that of the lake trout, which apparently have greater difficulty in finding sufficient food during the winter months.

Scale readings were made to determine the ages of the fish examined. They involved considerable difficulty, largely on account of the slow growth, especially during the early years of life. The readings were made by Hildebrand, and both authors are indebted to Dr. Van Oosten of the U. S. Fish and Wildlife Series for advice in this matter. Lengths given here are total lengths (tail in natural position):

| Length | Age | Length | Age | Length | Age | Length | Age |
|---|---|---|---|---|---|---|---|
| *cm.* | *yrs.* | *cm.* | *yrs.* | *cm.* | *yrs.* | *cm.* | *yrs.* |
| 34 | 9 | 43 | 12 | 46 | 14 | 47 | 14 |
| 35 | 12 | 44 | 14 | 46 | 15 | 48 | 12 |
| 38 | 12 | 44 | 11 | 46 | 14 | 48 | 14 |
| 40 | 14 | 44 | 11 | 47 | 15 | 48 | 14 |
| 40 | 14 | 45 | 12 | 47 | 14 | 48 | 14 |
| 40 | 13 | 45 | 13 | 47 | 15 | 49 | 14 |
| 40 | 13 | 45 | 13 | 47 | 12 | 50 | 14 |
| 41 | 11 | 45 | 14 | 47 | 10 | 51 | 14 |
| 43 | 13 | 46 | 14 | 47 | 14 | | |

The number of specimens (35) is too small to allow any general plotting of a growth curve, but it is large enough to show clearly that the growth rate is very slow. The population studied comes from an area where the natives fish regularly.

Whitefish are of only nominal importance to the Eskimos of the Ungava Bay region. Fishing is carried on chiefly during the fall, when the ice is thin, and a few are caught in the brackish estuaries in the summer during the anadromous run of the arctic char. It is clear that any development in lake fishing by the natives must take place in the winter, when the snow affords a highway to many

of the lakes which are accessible in summer only by long and difficult portages.

The Nascopie Indians who trade at Fort Chimo do much more lake and stream fishing than do the Eskimos, and the whitefish occupy an important place in their diet.

An attempt was made in the 1870's by the Hudson's Bay Company to obtain enough whitefish to supply the post at Fort Chimo. Mr. Goudie of Northwest River, employed to make the experiment, established an experimental fishing station on the lake which now bears his name. No figures have been discovered to show the progress of this mission, and the memory of it is vague even amongst the oldest natives. It appears to have been abandoned before 1880; the slow growth rate of these fish in the northern parts of its range gives one possible explanation for the short life of the enterprise.

Whitefish are regularly caught in salt water in James Bay (Lower, 1915) and in other parts of the north. However, no substantiated occurrence of whitefish in the salt water of Ungava Bay was recorded, although they are regularly caught in char nets in brackish water. So far as could be ascertained, they are not caught in nets set for arctic char along the sea coast.

**Prosopium cylindraceum** (Pallas). Round whitefish; kapisilik

Ranges from the Yenesei River in Siberia across northern Alaska, Great Bear Lake, Baker Lake and Fort Chimo, south to the Great Lakes and Maine. In the Ungava Bay drainage this is apparently a rare fish. Turner (1885) obtained a single specimen by hand from the Koksoak River; this specimen is now in the U. S. National Museum. The only other specimen was obtained by Hildebrand from a native fisherman at McKay's Island, also in the Koksoak River. This second individual is in the McGill University collection. It measures 37.5 cm. total length; the gill-raker count is: upper arch 6, lower arch 11, total 17; the estimated age from the scales is 8+ years.

As the natives do not distinguish between the coregonids of the region, no information on the occurrence of the round whitefish could be gathered. They claim that the river "kapisilik" differ from the specimens caught in lakes, and it is possible that a greater percentage of round whitefish in the river catch is the basis for this.

It is to be noticed that all the coregonids in our present area, according to native reports and the experience of the writers, seem to have their effective limits of dispersal at or near the tree line. This suggests that further investigation on the causes of this limit, whether they are climatic or biotic, or both, would be of great general ecological interest.

**Mallotus villosus** (Müller). Caplin

A north Atlantic form. Sleggs (1933) gives the southern boundary of distribution as corresponding with the 45°F. isotherm, with stragglers to the Gulf of Maine and Oslo Fjord in Norway. Northward, caplin are known from the White Sea, Spitsbergen, Iceland and both east and west coasts of Greenland. The westward extension in the Canadian arctic is complicated by the fact that

the central arctic caplin has not been determined since the Pacific form was separated as a valid species, *M. catervarius*. The genus is nearly circumpolar, and appears to be continuous across the North American arctic. Saemundsson (1949) refers this whole range to the one species, *villosus*. The great numbers in which this species appears at certain times of year are well known over the whole of its range.

In Ungava Bay the precise times and places of its appearance are not fully known. Turner (1885) describes its appearance in great abundance at the mouth of the Koksoak on August 8, 1884, when as many specimens as wanted could be dipped up by hand net. Turner's specimens are now in the U. S. National Museum, and were reported upon by Kendall (1909). Turner made the interesting comment that this was the first appearance of caplin in the southern portion of Ungava Bay. Taken together with another observation of Turner's, namely that the caplin were at that time going farther and farther north up the Labrador coast each year, it would appear that the 1880's were comparable in this respect to the present decades, in which the caplin, along with many other fishes, are extending their range northward (Jensen, 1939, etc.). It has already been pointed out by Dunbar (1946) that the decade of 1880 appears to have been somewhat warmer in west Greenland, at least so far as the marine climate is concerned, than the two decades following. Turner, writing in 1885, adds: "within Hudson Strait they [the caplin] had not been detected until several years ago when a few were seen in the neighbouring waters of George's River".

In contrast to Turner's catch in the Koksoak, only three specimens of *Mallotus* were obtained during the present field work in 1947, 1948 and 1949. These were young individuals, 5.5 cm. long, with the larval pigmentation, taken in plankton nets set from a stationary boat in the tidal current between the mainland and an island, at station 51, (Pitsulasitik, August 29, 1947). In three seasons some 750 cod stomachs (*Gadus callarias*) were examined at Port Burwell, but not a single specimen of *Mallotus* was found in them. On the Labrador coast, it is a common statement that the caplin precede the cod northward each year; the caplin, however, apparently has little or nothing to do with the movement of the cod into Ungava Bay. In point of fact, this appears to be true also of the cod in northern Labrador. Cape Harrigan is given by Thompson (1943) as the limit of the region in which the caplin figures in abundance in the food of the cod. Templeman (1948), on the other hand, publishes records of caplin being taken at cracks in the ice at Nain, during the winter.

Sleggs (1933), describing the habits of the caplin along the Newfoundland shores, states that the spawning swarm, or "rolling" of the caplin in the surf, occurs when temperatures are below 10.5°C., and generally between 8.5°C. and 10.5°C. (surface temperatures). Templeman's (1948) figures are lower, showing spawning swarming behaviour to occur between temperatures of 5.6° and 8.4°C. These temperatures are well above the maximum surface temperature during the present years anywhere in Ungava Bay. This again suggests that the waters of Ungava Bay were possibly warmer during the time of Turner's field work than they are at present. And yet Turner, in an undated manuscript narrative part of

which is housed in the Smithsonian Institution, describes being ice-bound at the mouth of the George River at the beginning of August 1882. Serious ice at that time of the season in the present years is not known. It is clear that much valuable information on cycles in the marine climate would have been obtained by routine observations at sea during the history of the trading into Ungava Bay.

**Catostomus commersoni** LeSueur. Common white sucker; miluiak

Ranges from the Mackenzie River to the Patricia district of Ontario; from the Koksoak River in Ungava south to Georgia and the Gulf of Mexico. There are no records from north of the tree-line.

In the Ungava Bay region, this species is known definitely only from one lake, Lake Mendry near Chimo. Turner obtained a specimen here in 1883 (Kendall, 1909). Hildebrand took three specimens in a small stream connecting Lake Mendry with a smaller lake to the south, in a gill net set in eight feet of water. Rousseau (Legendre and Rousseau, 1949) collected this species from the George River, some distance upstream, in latitudes 55° and 57°. Our records indicate that it is much less common than the following species.

**Catostomus catostomus** (Forster). Sturgeon sucker; miluiak

Found from the Kotzebue drainage of Alaska east in northern Canada to the Keewatin district of the Hudson Bay drainage and farther to Leaf River and Chimo in northern Quebec, and the Labrador; south to Minnesota, the Great Lakes and northeastern New England.

This species was reported from three stations in the George River by Rousseau, and eleven specimens were obtained by Hildebrand from Lac Berthet (Goudies Lake) and Lake Stewart, where it was the only species of sucker found. They were caught in gill nets in water of from 8 to 26 feet in depth, and ranged in length from 35 to 40 cm.; one large individual measured 55 cm. When landed through the ice they survived for a considerable length of time, in contrast to the whitefish, which succumbed immediately. They were observed to be approaching maturity during early April 1948, and eggs found in whitefish stomachs suggested that possibly a few suckers had already spawned.

The northward limit of the distribution was not determined. Native reports indicate that in some lakes along the Leaf River it is extremely common. No authenticated report of its occurrence north of the tree-line was obtained. Rousseau (loc. cit.) did not take it in the Payne River area, nor did we find it on Killinek Island (Burwell).

Suckers are not valued by the Eskimos as food; they are used chiefly as dog-feed, and as such they can have some importance to the native economy. Most of the fish are caught in gill nets set under the ice in the fall. Large numbers are also caught in the spring, before break-up, especially on bright sunny days, according to one report. At this time the suckers are apparently moving to the spawning beds. To the Indians in the neighbouring bush country the suckers are of more direct significance, periods being recorded when they formed the bulk of the diet for several months.

**Couesius plumbeus** (Agassiz). Lake northern chub

This species was not found by the authors of this paper, but two specimens were obtained from the George River, far upstream, in a small tributary five miles west of Indian House Lake, by Rousseau (Legendre and Rousseau, 1949) in 1947. This was the first, and so far the only, record of a cyprinid north of the St. Lawrence drainage in this region.

**Paralepis rissoi kröyeri** Lütken

A north Atlantic species, of general distribution, usually in deep water, from about 30°N. latitude to the waters of Greenland. Jensen (1942) states that it is known from west Greenland on the basis of five specimens, two from Umanak Fjord, and three from the extreme southwestern tip of the island.

In Ungava Bay the species has not been recorded before. Six specimens were taken from cod stomachs (*Gadus callarias*) in Forbes Sound, Port Burwell, on August 21 and 23, 1947, one on August 7, 1948, and two on August 3, 1949, all from cod stomachs and all from the same locality. Vertebral counts were not possible on all the specimens, owing to damage by digestion. Two of the 1947 specimens had counts of 83 and 84, the 1948 specimen showed 83 vertebrae, and one of the 1949 specimens had 85. It is on the basis of these counts that the specimens have been referred to *P. rissoi kröyeri*, after Ege (1930).

*Paralepis* has not been recorded hitherto from the Canadian arctic. It is an Atlantic genus, and a migrant form, as is shown by the wide separation between the areas of adult and juvenile capture (Jensen, 1942). It probably enters northern waters by the Atlantic Drift route, arriving in west Greenland and Ungava Bay by way of the Irminger current. The effects of the cooling of the west Greenland current as it progresses northward are apparently well shown by *Paralepis*, according to Jensen (1942, p. 19), who writes: "So strongly does the water gradually become cooled that these fishes are paralyzed . . . becoming an easy victim to seals and fishes of prey, or they float dying or dead up to the surface of the water, and thereupon may drift ashore".

This is undoubtedly a rare fish in Ungava Bay, even at Burwell, whither it must be carried by Atlantic water from west Greenland. It was unknown to the resident Eskimos at Burwell. Such a distinctive fish, which we obtained up to 255 mm. in length, would almost certainly be remembered by the natives if they were washed ashore even rarely in the inhabited region of Killinek Island.

**Lampanyctus crocodilus** (Risso). Lantern fish

Bathypelagic in distribution in the Mediterranean and Atlantic; not previously recorded from Ungava Bay, or from any station in the Canadian arctic. Jensen (1926) reported this species as common south of the submarine ridge between Baffin Island and Greenland. Several damaged specimens from cod stomachs were taken at Burwell in August 1947, one specimen in 1948 and again a few in 1949. Like the foregoing species, *Lampanyctus crocodilus* is an Atlantic bathypelagic immigrant into Ungava Bay, although it is able to breed in much colder water than *Paralepis*. The Ungava Bay specimens are imperfect, and most

of the photophores are absent. The 1947 specimens were referred to this species by the late Dr. S. F. Hildebrand on the basis of a comparison of body proportion and fin positions with other species of lanternfish known from the north Atlantic.

*Lampanyctus* is a deep-water form, but like many Atlantic deep-water forms, it is clearly found in shallower water at the northern limits of its range. All the Ungava Bay specimens came from cod stomachs, and all efforts to catch cod in water deeper than about 25 fathoms were unsuccessful. The following data were obtained from the present material: Total length 66 to 126 mm., gill rakers approximately 26, vertebrae 43 to 46, dorsal rays 18.

**Myctophum glaciale** (Reinhardt). Glacier lanternfish

Known from north Atlantic and arctic waters. Along the coast of Greenland, this is one of the most northerly of the bathypelagic fish in distribution, and it is found both north and south of the submarine ridge between eastern Baffin Island and west Greenland. It has not previously been recorded from Ungava Bay. Specimens were obtained from the stomachs of Atlantic cod at Burwell in both 1947 and 1948, and on August 13, 1948, one of the Eskimo crew collected a perfectly preserved specimen from the surface of the inner harbour of Burwell. Several of the specimens taken from cod stomachs were too small and damaged for certain identification, and have been referred to this species only tentatively.

The 1947 specimens were taken between August 19 and 25; a careful watch for this species was kept in examining cod stomachs at Burwell during the first part of August 1948, but none was obtained before August 11, when they were the most abundant vertebrate constituent in the stomach contents. It is possible that *Myctophum* does not arrive at Port Burwell until the seasonal warming effect reaches its maximum. In 1949, however, specimens of Myctophidae were obtained in cod stomachs on August 3, whose identification was uncertain.

The glacier lanternfish is well known to the Eskimos of Port Burwell, who call it "mikiapic kapisilik" (the very small fish with scales). One native stated that he had often seen them on the surface of the water in McLelan Strait, and that they are often dead or dying.

**Esox lucius** Linnaeus. Northern pike; kikiyuk

A holarctic northern form. In northern North America the northern pike ranges in suitable habitats to the northern limit of the mainland. Records exist from Point Barrow, Alaska, the delta region of the Mackenzie, and the drainages of Hudson Bay and Ungava Bay. In Ungava Bay it was first reported by common name by Davies (1854). Legendre and Rousseau (1949) recorded it on the basis of field notes from the George River at three stations. No specimens were taken by the present writers, but one damaged individual, caught by Eskimos and chewed by dogs, was referred to this species in 1947, with considerable doubt.

Eskimos report that an occasional specimen is taken in the Koksoak and the George River in the vicinity of the trading posts. Farther inland it is reported as common, and as being taken often by the Indians in the Fort Mackenzie region. Certain lakes in the Whale River drainage are stated to contain large

numbers of the northern pike. There seems to be no evidence for the invasion of salt water, but it is occasionally taken in brackish water in the Koksoak. The Eskimos of Fort Chimo know this species as "kikiyuk" on account of its large teeth. It is known to do occasional damage to gill nets.

**Boreogadus saida** (Lepechin). Arctic cod, arctic pollack; ovak, ogac.

(The Ungava Eskimo use the same word for the polar cod, the Atlantic cod and the Greenland cod; in this the dialect differs from Greenlandic Eskimo, which has separate words for the three species.)

The polar cod is circumpolar in distribution, the southern limit depending apparently upon the degree of admixture of non-polar water. It is considerably less abundant along the margin of the subarctic area than in the pure polar water farther north. In Ungava Bay, the species was first collected by L. M. Turner (Kendall, 1909). Turner (manuscript, 1885) states that when his ship was beset among the ice floes in Ungava Bay, the polar cod was observed to be very common. Vladykov (1933) recorded this species from Port Burwell, taken in the stomachs of Atlantic cod.

Several damaged specimens of *Boreogadus* were taken from cod stomachs at Burwell by the present writers. One specimen was taken from the stomach of a bearded seal (*Erignathus*) about ten miles northeast of the Gyrfalcon Islands in July 1948. A small gadid observed by Hildebrand in the same month, swimming among the ice floes, probably belonged to this species. One pelagic young was taken in a plankton tow near Burwell in August 1947.

One native at Burwell reported that only "small cod" occurred there during the winter. It is known that most or all of the Atlantic cod (*Gadus callarias*) migrate away from Burwell in the late fall, but the "small cod" described here may be either the polar cod or the Greenland cod (*G. ogac*), or both.

The polar cod is a pelagic form, found from the surface to about one thousand metres. It is very commonly found in water containing abundant ice, and it has even been recorded from pools on the ice-floe surfaces. Very little is known of its spawning habits. Murdoch (1885) reports that pelagic fry are taken in the inshore water at Point Barrow in July, and considerable numbers of them, from 10 to 21 mm. in length, were recorded by Dunbar (1947a) in the coastal waters of Baffin Island in July, August and September.

Turner, in his 1885 manuscript, comments on the bright coloration of this little cod, describing specimens three inches in length and under, taken from among the ice floes of Ungava Bay during the first few days of August 1882: "I do not remember to have seen colors on fishes to be so brilliant as were shown on these. The palest olive green above; brilliant purple reflections of ever-changing hue on sides of silvery white, and pure silver white on the lower parts. These colors so constantly undergoing changes that the sides were scarcely half a second of time the same color".

The details of taxonomy of the polar cod are little known. Russian workers have recently recognized two genera with two species each, occurring in the circumpolar region. Our material from Ungava Bay is as yet too fragmentary to allow for comment on the taxonomy.

**Gadus callarias** Linnaeus. Atlantic cod; ovak, ogac (see note on Eskimo name under *Boreogadus saida*)

An Atlantic fish, found northward almost to the limit of the subarctic, and southward to New England and France. Recorded from Novaya Zemlya, Spitsbergen, Iceland and Greenland. In Greenland it is found at least as far north as Upernavik, in latitude 73°, in summer.

In Ungava Bay, the identity of the cod occurring at Port Burwell was definitely established for the first time by Vladykov (1933), as *callarias*. Many early travelers had reported codfish from Burwell, using the common name and collecting no specimens. They are present only during a few weeks in summer, from the beginning of August to the end of September or early October. The precise time at which they disappear from the vicinity is not known; there are as yet only Eskimo reports to go on, and since the natives do not at present make much use of the cod the reports are not necessarily reliable.

The local habits of the cod in the Burwell area were found to be such that their occurrence during the months of August and September is patchy. Shallow shelves off the shores of the islands gave the best fishing results, in depths between about six and sixteen fathoms, the cod being taken in smaller numbers down to thirty-five fathoms. Details of the fishing techniques used, and also of the biology of the Atlantic cod at Burwell, will be published separately in a later paper in this series.

**Gadus ogac** Richardson. Greenland cod, fjord cod; ogak, ovak (see note on Eskimo names, under *Boreogadus saida*)

Predominantly west Greenlandic in distribution, but found along the arctic coast of Canada to Bathurst Inlet; Hudson Strait, and south along the Labrador to the Gulf of St. Lawrence. In Ungava Bay, the Greenland cod was first reported by Kendall (1909) from the Turner collection. Vladykov (1933) reported it from Burwell. Turner (1885) described it as being "quite plentiful along the Labrador coast and as far within Hudson Strait as the mouth of George's river. At the latter place they are, however, quite rare, oftener seen dead than alive. They are occasionally found with their livers cut out by the seals, which catch them, and the bodies are thus cast on the ice or shore". The Greenland cod cannot be considered common in Ungava Bay, on the basis of the present field work, but it is possible that it occurs locally, in special habitats which have not yet been discovered. During four seasons of collecting (1947-50), by dredge, long line and hand line, on both sides of Ungava Bay from the Button Islands and Burwell around the inshore and offshore waters to Cape Hopes Advance, only one specimen of *Gadus ogac* was taken, at Burwell (Forbes Sound) on July 6, 1949, by hand line. One other specimen was sent to the senior author by Father Steinmann, collected on July 25, 1949, at Koaktuk in Diana Bay. It is not of any significant importance to the Eskimos.

**Lota lota maculosa** LeSueur. Burbot, loche; mari, shulukpaoluk

The burbot is circumpolar in distribution; *maculosa* is known from the eastern part of the Hudson Bay drainage to Labrador, south to Delaware, across

the United States to the Columbia River system. The area of intergradation with *L. l. lepturus* of the Yukon system is not known. In Ungava Bay it was first reported by Kendall (1909), based on Turner's specimens from Fort Chimo. The present writers obtained no specimens of this species. It is known to the Eskimos of the Chimo region, but is never taken in large numbers. On the other hand, Turner in his 1885 manuscript says of the burbot that it is "quite common in the lakes of Ungava district; in fact more common than the number of specimens obtained would indicate". Turner took four individuals. They are caught by the Indians inland, rather than by the Eskimos. Turner mentions the Indian name "mari" for the burbot, and remarks that it is also used by the Eskimos. The name "Shulukpaoluk", an Eskimo word, is also used. It means "feathered like an arrow" and refers to the long dorsal and anal fins; being a descriptive name, it is also applied to other fishes with similar fin patterns, in particular the eelpouts.

**Reinhardtius hippoglossoides** (Walbaum). Greenland halibut, arctic flatfish; natarnak (this is the name applied by the Greenland Eskimos to the Atlantic halibut only (*Hippoglossus*); in Ungava Bay it seems to apply to any flatfish)

General distribution subarctic and arctic, known from northwest Greenland and Spitsbergen south to Norway and Newfoundland, rarer as far as Cape Cod. The Greenland halibut has not been reported previously from Ungava Bay. Between August 19 and 25, 1947, 29 small specimens from 3 to 5 inches (7.5 to 13 cm.) in length were taken from stomachs of the Atlantic cod at Burwell, and in the succeeding three seasons these small *Reinhardtius* were found to be one of the commonest fishes in the diet of the cod at that station, at least during the month of August. They were not taken elsewhere. Specimens of similar size were also taken occasionally in the dredge hauls, and once in an otter-trawl, at depths down to seventy fathoms, in Forbes Sound. Vertebral counts varied between 61 and 64, and anal rays from 72 to 75. These figures, together with the symmetry of the mouth and the vertical position of the left eye, are diagnostic for *Reinhardtius*.

No adult specimens of the Greenland halibut were taken. The long line fishing was not successful for any kind of fish; nor were the depths of water investigated (down to about two hundred metres) sufficient to reach the known vertical range of the adults. In Greenland they are caught in considerably greater depths. One pleuronectid, however, of larger size, was taken from the stomach of a Greenland shark at Port Burwell (see above). It was incomplete, lacking several tail vertebrae and part of the skull, and measured in this condition 36 cm. Fifty vertebrae were present, the number being incomplete, and the left orbit was vertical in position. On these characteristics alone, it is very probable that the specimen should be referred to *Reinhardtius hippoglossoides*.

Apart from this specimen, the largest obtained in Ungava Bay (all specimens came from the vicinity of Burwell) was 158 mm. in total length. Jensen (1935) states that the Greenland halibut is bilaterally symmetrical in West Greenland waters up to 54 to 57 mm., and is pelagic until a length of about 80 mm. is reached.

From the frequency with which the young *Reinhardtius* were taken from cod stomachs at Burwell, it is clear that it is a fairly abundant member of the shallow water benthos. Until the adults are found, however, it is not possible to determine its possible economic value to the native population. One Eskimo at Burwell reported having seen a flatfish washed ashore in the autumn of 1947 in Lenz Strait, off the northeast tip of Killinek Island.

No other species of flatfish has been recorded from Ungava Bay. Kendall (1909) assumed that specimens of pleuronectids collected by Lucien Turner and labelled "Labrador" came from Ungava Bay, since Turner did most of his collecting there. Turner's own manuscript, however, makes it clear that his specimens came from Rigolet, on the Labrador, and that "no species [of *Pleuronectes*] was obtained from Hudson Strait".

**Gasterosteus aculeatus** Linnaeus. Three-spined stickleback; kakilishek

A circumpolar form in fresh and coastal salt water south to north Africa, northern China, southern Japan, Lower California and Chesapeake Bay. The northern limits of distribution in arctic Canada are uncertain, but it has been taken in Baffin Island and Hudson Strait, and in James Bay. It is common in south Greenland. In Ungava Bay it is one of the most common fresh-water fish throughout the area. The present writers have specimens in the McGill University collection from the Koksoak River at Forth Chimo, from the George River and from the region of Cape Hopes Advance. It has also been observed to be very abundant in Payne Lake (Legendre and Rousseau, 1949). During the present field work, it was found in most streams and lakes visited. Many ponds with no apparent means of access for fish contained this species. In the Koksoak River *Gasterosteus* was taken in tidal pools; adults with nearly ripe gonads were taken on June 28, 1948, in such pools.

In Bobs Lake, close to the George River trading post, *Gasterosteus* was found in 1948 to be heavily infested with the cestode *Schistocephalus*, from one to six worms being taken in the body cavity of almost every fish examined. Identification to species was not made; the genus is known from fish-eating birds, such as gulls and mergansers.

**Pungitius pungitius** Linnaeus. Nine-spined stickleback; kakilishek

A very widespread species, in both fresh and salt water; not recorded from Greenland or Iceland; found south to Central Europe, Saskatchewan and the Great Lakes, and coastwise to New Jersey; recorded from Baffin Island and King William Island, and islands in Hudson Bay. It was first reported from Ungava Bay by Kendall (1909), and the present McGill University specimens are from Leaf Bay, the Koksoak River at Fort Chimo, False River and Tunulik River. Rousseau obtained this species at the outlet of Payne Lake (Legendre and Rousseau, 1949). The species was found to be very common in streams draining into Leaf Bay, in brackish water, and was also taken in fresh water in the Kasigiaksiovik River (Leaf Bay). It was common in tidal pools on the Koksoak River, but not so numerous as *Gasterosteus*. One specimen was taken in a stramin net set in the tidal current near Tunulik on August 29, 1947.

The variations in a given population of *Pungitius* have not been delineated; in this paper, *P. brachypoda* Bean, described from Cumberland Gulf is regarded as synonymous with *P. pungitius,* following Vladykov (1933) and Pfaff (1937). In 17 specimens from Ungava Bay the dorsal spines ranged from 9 to 11.

**Ammodytes dubius** Reinhardt. Lesser sand eel, sand launce

The genus *Ammodytes* has recently been studied by Jensen (1941), who has shown that the species *lancea, marinus* and *dubius* can be regarded as representing a cline, geographically ranging from northwest Europe to arctic waters, with increasing numbers of fin rays and vertebrae from south to north, following the well-known pattern in fishes. Saemundsson (1949) refers to this form in Iceland as "*Ammodytes lancea*-group". Jensen (1941) concludes his study as follows: "The general impression is, in my opinion, that the different conditions under which the species *Ammodytes lancea* lives, e.g. depth, temperature and salinity of the water, spawning time, contribute towards the formation of subspecies and races, which in this respect can be considered as ecologically conditioned".

The specimens from Ungava Bay all belong probably to *dubius,* the arctic form, although most of the specimens are immature planktonic larvae and cannot be determined with certainty; the fin rays in many of them are not completely developed. The majority (187 specimens) were taken in plankton nets at station 51 (Pitsulasitik), on August 29, 1947, in quite shallow water (five to six metres). The bottom was a muddy glacial sand. In 1949, a few very small specimens were obtained in plankton nets at stations 103 (off Burwell), 124 (near mouth of Koksoak River), and 129 (ten miles north of the Koksoak mouth). One fully developed specimen was obtained at station 101 (near Beacon Island). Measurements and counts on this specimen are as follows:

| | |
|---|---|
| Length | 59 mm. |
| Head | 12 mm. |
| Head in length | 4.9 |
| Dorsal rays | 63 |
| Anal rays | 31 |
| Pectoral rays | 14 |
| Vertebrae | 74 |

These figures agree with Jensen's counts for *A. dubius.*

This is the first record of this species from Ungava Bay. It was not taken from cod stomachs at all.

**Sebastes marinus** Linnaeus. Rosefish

A north Atlantic fish, known on the North American side from Umanak in west Greenland south to New York. It has not hitherto been recorded from Ungava Bay. Only two small specimens were taken during the present field work (1947-49), from cod stomachs at Port Burwell during August 1947.

**Triglops pingeli** Reinhardt

North Atlantic, north Pacific, and Arctic, in various subspecies. Specimens

have been described from Hudson Bay by Vladykov (1933), and referred to the Pacific subspecies *beani*.

The present material consists of 26 specimens, taken as follows:

Ringed seal (*Phoca hispida*) stomach, off mouth of Koksoak river, July 7, 1948. Ten small specimens.

Cod stomachs, Port Burwell, August 1947 and 1948. Ten small specimens.

Dredge samples. Station 107 (Forbes Sound), 30-40 fathoms, July 7, 1949. One small specimen.

Station 126 (between Payne Bay and Akpatok Island), 36-50 fathoms, August 23, 1949. Three specimens.

Planktonic young, two specimens (24 and 28 mm., total length); station 101 (south of Beacon Island), June 26, 1949.

The largest specimen is only 95 mm. standard length. The material from the cod and seal stomachs is not identifiable to subspecies, and the planktonic young are too immature. The four dredged specimens (all of them males) have the following measurements and counts:

| Standard length (mm.) | D | A | P | V | Depth of caudal peduncle into standard length % |
|---|---|---|---|---|---|
| 67 | XI, 24 | 25 | 19 | I, 3 | 4.0 |
| 68 | XI, 25 | 25 | 18 | I, 3 | 4.1 |
| 61 | X, 24 | 24 | 19 | I, 3 | 4.4 |
| 95 | XI, 25 | 25 | 19 | I, 3 | 4.0 |

Following the recent revision of the species by Jensen (1944), these specimens are thus referred to the subspecies *T. p. pingeli*, known hitherto from east and west Greenland, and the coast of Baffin Island. Vladykov (1933) referred his Hudson Bay specimens to the Pacific subspecies *beani*, largely on the basis of the depth of the caudal peduncle, following Rendahl (1931). The typical *beani* has a caudal depth of 2.3 to 2.4 per cent of the body length; the Hudson Bay specimens examined by Vladykov were fairly close to this figure, with 2.6 to 2.9 per cent. Vladykov also reported other Pacific affinities in the Hudson Bay fauna.

**Triglops nybelini** Jensen

Jensen (1944) established this species from specimens from west and east Greenland water, and from Jan Mayen, differing from *Triglops pingeli* in the following characteristics: eyes larger; pectoral rays 20 to 22 (16 to 19 in *pingeli*); central ray in ventral fin longer than the others (innermost ray longest in *pingeli*); and the colour pattern, which lacks the saddle marking of *pingeli*, and is characterized by longitudinal dark bars along the lower sides, below the lateral line.

The Ungava material includes one specimen of a young *Triglops* which appears to belong to this species. Taken in a No. 00 silk plankton net towing at about thirty metres depth, the specimen measures 27 mm. standard length, 31

mm. total length. The snout-anus distance is 2.7 in the total length, and the fin-ray counts are: D, X-25; A, 26; P, 22. The central ray of the three soft ventral rays is the longest, and the eye is very large. In all these characters it agrees with the description of *T. nybelini* published by Jensen, and moreover it differs in all these respects not only from the descriptions of adult *T. pingeli*, but from the young planktonic individual of *pingeli* described and figured by Dunbar (1947a), taken in southern Baffin Island. The present specimen was taken at station 128, southwest of Akpatok Island, on August 24, 1949.

As in most cases of planktonic young fish, there are details of proportion and colour which differ from the adult condition. The lower jaw thrusts slightly forward of the tip of the upper jaw, and the adult coloration is not developed. The most striking colour characteristic is a dark line along the back, on either side of the base of the dorsal fins, extending from the front of the first dorsal to the caudal fin. The peritoneum is very dark (Figure 1).

**Cottus cognatus gracilis** Häckel. Common slimy muddler, bullhead

This species has been previously reported from Chimo by Kendall (1909), from Turner's specimens. The present writers found it to be very common on the Koksoak River and in tributaries, in brackish water particularly. It was very abundant in tide-pools, often found together with *Gasterosteus.*

**Myoxocephalus scorpioides** (Fabricius). Arctic sculpin; kanayuk

Common in shallow water in the North American arctic and subarctic, from the coasts of Greenland and Baffin Island south to the Gulf of St. Lawrence, and west along the arctic coast of Canada to Dolphin and Union Strait. In Ungava Bay it is one of the commonest sculpins in the shallow coastal water, being taken chiefly in the intertidal zone or immediately below it. It was taken by hand line, and occasionally in shallow-water dredge hauls, all round the shores of the bay, including Port Burwell, Keglo Bay, at the mouth of the Tunulik River, Leaf Bay, and Inukshuktuyuk.

Although over three thousand pelagic fry of cottids were examined from Ungava Bay, it was found impossible to separate the young of *M. scorpioides* from those of *M. scorpius.* The older specimens, however, are fairly simply separated. Vladykov (1933) gives five points of difference, one of which, the completeness of the lateral line in *scorpioides,* is not valid for our present specimens, since the lateral line is also complete in many of the *scorpius* individuals. On the basis of the present material, the following appear to be good *scorpioides* characteristics: (1) The head spines are developed into soft tentacles; (2) there are warty prominences on the head; (3) the ventrals are shorter than in *scorpius,* not reaching the anus; (4) the pectorals reach only just to the front of the anal fin; (5) pectoral rays number 15-16, not higher (17-18 in *scorpius*); (6) the caudal peduncle is longer than in *scorpius;* (7) the mouth is smaller and the maxilla shorter, the latter reaching to the middle of the eye; (8) the snout is considerably narrower and sharper than in *scorpius.* The presence or absence of a pore beyond the last gill slit appears to be a less reliable characteristic.

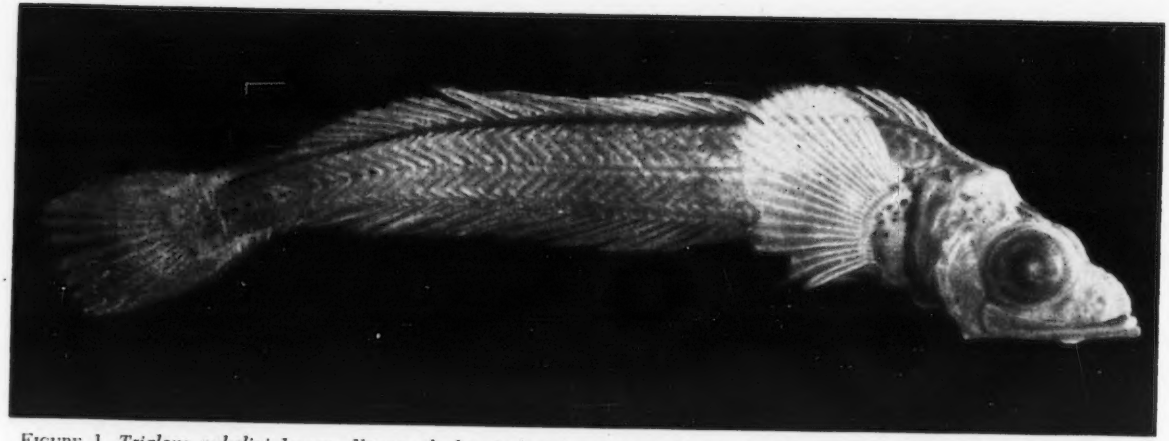

FIGURE 1. *Triglops nybelini* Jensen. Young planktonic larval specimen, 31 mm. total length. (Photograph by J. W. Pollock.)

The arctic sculpin, particularly in the young stages, favours intertidal regions where small streams enter the sea. This is true also of *M. scorpius*; in both species, this preference is lost in the adult. It was found to subsist largely upon the littoral amphipod *Gammarus locusta*. It does not reach the size of *scorpius*, and has no value to the Eskimos.

**Myoxocephalus scorpius** (Linnaeus); (Syn. *M. groenlandicus* (Cuvier and Valenciennes)). Daddy sculpin, common sculpin; kanayuk

This species has been recognized as *M. groenlandicus* principally by American authors. There appears, however, to be no set of characteristics which definitely distinguish the American from the European form. Pfaff (1937) has pointed out that the North American specimens tend to reach a larger size and to have a greater number of fin rays. The specimens taken by the present authors in Ungava Bay are very close to the range of fin rays of specimens from the North Sea given by Duncker (1927):

| | |
|---|---|
| North Sea: | D. VII-XI, 14-17; A. 10-14; P. 16-17 |
| Ungava Bay: | D. VIII-XI, 15-17; A. 13-15; P. 16-18 |
| Hudson Bay, Hudson Strait: | D. IX-XII, 15-18; A. 12-15; P. 17-18 (Vladykov, 1933) |

*M. scorpius* is known from the coast of arctic North America from Dolphin and Union Strait to Ungava, and from Baffin Island, Greenland, Iceland and Spitsbergen south to New York and the Bay of Biscay. Vladykov (1933) considers that *M. stelleri* of the Bering Sea should be reduced to a variety or subspecies of *M. scorpius*. In Ungava Bay this is the commonest fish in the inshore waters, recorded by hand line from Payne Bay, Leaf Bay, the estuary of the Koksoak, False River, George River, Keglo Bay, Adlorilik and Killinek Island. In addition, about two thousand planktonic young were taken in plankton nets from all parts of the bay. The shallow water within a few miles of the mouth of the Koksoak River was found to be especially rich in the planktonic young of several fishes, including *scorpius*. This species has been shown to dominate in subarctic rather than high-arctic waters; in the latter its place seems to be taken by the next species, *Oncocottus quadricornis* (Dunbar, 1947b).

In size, the daddy sculpin was taken up to 18 inches (46 cm.). The colour was extremely variable, from black to a pale olive green on the dorsal surface, and from white to blotched with yellow and orange ventrally. It is omnivorous in habit. The commonest food found in the stomachs was *Gammarus locusta*, but specimens taken in the deeper parts of the littoral were found to be feeding chiefly on crabs and prawns. Fish remains were not common; one specimen contained a large lumpenid blenny in its stomach, others occasionally contained the young of their own species. The specimens were heavily parasitized by nematode worms, and every individual examined contained several in the liver.

This species is not unimportant to the native population. Cooking pots in native shacks and boats were observed to contain the daddy sculpin many times during the summer season, and women and boys make a practice of jigging for

them on the ebb tide, especially if other sources of food are in short supply. They may also serve as dog-feed, and indeed the dogs themselves sometimes catch them in tide-pools or at the water's edge.

**Oncocottus quadricornis** (Linnaeus); (Syn. *Myoxocephalus quadricornis*). Four-horned sculpin; kanayuk

In general a high-arctic form, known along the entire arctic coast of North America and Asia, and north to Spitsbergen, Jan Mayen, arctic (as opposed to subarctic) parts of Greenland and the Canadian Arctic Archipelago. It has been reported from Floeberg Beach, northern Ellesmere Island, the most northerly record of any marine fish in the North American sector. There is a relict form in the Baltic Sea and several freshwater relicts.

This species is here reported for the first time from Ungava Bay on the basis of four specimens obtained in 1947 and 1948. One specimen was taken in the dredge in Leaf Bay in 15 metres of water; two were caught by hand in a tidal lake near Port Burwell; and one was found dead on the tidal flats at Fort Chimo during the spring tides in September 1948. They were all small, ranging from 64 to 106 mm. total length, with the following fin ray count: D VIII, 14-15; A 14-16; P 14.

The scarcity of *Oncocottus* in Ungava Bay in comparison with *Myoxocephalus* is in agreement with the known general distribution of the two fishes, the former being the predominantly arctic form, the latter the predominantly subarctic; it also confirms the subarctic nature of the waters of Ungava Bay, which, although not easily amenable to demonstration by the study of physical oceanography, is inferred by the considerable number of Atlantic representatives in the fauna.

**Gymnocanthus tricuspis** (Reinhardt). Stag-horn sculpin

Known from arctic and subarctic seas south to Maine and Norway, common west to Hudson Bay. Common in Ungava Bay; it was first reported from there by Vladykov (1933) on the basis of two mature specimens collected at Burwell. The present material consists of five adults (taken in Keglo Bay (four specimens) and at the mouth of the Koksoak River (one specimen)), and a number of planktonic young taken at stations 18, 22, 37, 40, 124 and 129. A few damaged specimens were taken from cod stomachs at Burwell, and in addition there is a considerable number of larval specimens too small to be identified with certainty.

There has been considerable confusion in the taxonomy of this genus, and the authors are indebted to Dr. L. P. Schultz of the United States National Museum for permission to examine his manuscript on the problem. The junior author (Hildebrand) made a special study of a number of specimens of *G. tricuspis* from various parts of the north, and of its close relative *G. pistilliger*. Vladykov (1933) described a new subspecies of *G. tricuspis* (*G. t. hudsonius*) on the basis of two immature specimens from Nottingham Island and two mature specimens from Port Burwell, differing from the typical form (*T. tricuspis*) in the possession of longer ventral fins, longer anal papilla in

the male, complete absence of bony granulations on the head, and slightly different coloration. Until a larger body of material is at hand from the eastern arctic waters, we prefer not to identify the present Ungava Bay specimens to either subspecies. With regard to the bony granulations on the head, Hildebrand made the following observations on *Gymnocanthus tricuspis* material in the U.S. National Museum:

| | Granulation in: | | | | | |
|---|---|---|---|---|---|---|
| | Females | | | Males | | |
| Locality | none | weak | heavy | none | weak | heavy |
| Battle Harbour, Labrador | 1 | 3 | 1 | 0 | 0 | 0 |
| Assizes Harbour, Labrador | 0 | 0 | 0 | 0 | 0 | 1 |
| Anatalak bay, Labrador | 1 | 0 | 3 | 0 | 1 | 0 |
| Red Bay, Labrador | 0 | 0 | 0 | 0 | 0 | 2 |
| Nachvak, Labrador | 0 | 0 | 1 | 0 | 0 | 0 |
| Ungava Bay | 2 | 0 | 0 | 0 | 0 | 2 |
| Holsteinsborg, Greenland | 5 | 8 | 3 | 0 | 1 | 7 |
| Egedesminde, Greenland | 0 | 0 | 1 | 0 | 0 | 0 |
| Totals: | 9 | 11 | 9 | 0 | 2 | 12 |

Nine females and five males of *G. pistilliger*, and five females and three males of *G. galeatus*, all showed heavy granulations. All specimens, of all three species, were over 150 mm. in total length. It seems doubtful if the extent of granulation on the head can be considered a useful taxonomic character in *G. tricuspis*, on the present analysis.

The following is a synopsis of four adults taken in Ungava Bay:

**Females:** two specimens, 199 and 195 mm. total length.

D XI, 15-16; A 17-18; P 19. Head without bony granulations, ventrals reaching only to the vent, anal papilla very short; first dorsal yellowish with a few black bars on fin rays; abdomen white.

**Males:** two specimens, 193 and 195 mm. total length.

D XI, 15-16; A 17-18; P 18-19. Abundant bony plates on top of skull from the interorbital space to the insertion of the first dorsal; ventrals prolonged past the vent to at least the middle of the anal fin; pectoral fin roughened; anal papilla more than twice as long as in the females; dorsal fins high; spiny dorsal black, with two rows of light bars on fin rays; abdomen dusky.

Most of the pelagic young taken in plankton nets were small, below 20 mm. total length. Three, however, were slightly larger, and were sufficiently different, not only in size but in developing characteristics, from the specimens described by Dunbar (1947a), to make them of interest to the student of the juvenile taxonomy of the cottids. All three measured 25 mm. total length (22 mm. standard length), and showed the full fin-ray formula: D XI-XII, 15-16; A 17; P 19. The preopercular spine is slightly curved upward, and without the antler-like processes present in the adult, and there is the remnant of pigment spots along the mid-ventral line forward of the vent, characteristic of the young of this species. The nostrils are double, the anterior pair being produced in tubular fashion.

*Gymnocanthus tricuspis* was found to be commonest below about 30 metres, outside the shore zone inhabited by *M. scorpius*. The pelagic young were taken in the same hauls as other cottid planktonic larvae, usually in shallow water.

**Icelus bicornis** (Reinhardt)

The genus *Icelus* has recently been reviewed by Jensen (1949), whose work is followed here. *Icelus bicornis* was formerly given circumpolar range, but the Siberian and Bering Sea subspecies (*I. b. beringianus* Schmidt) has been shown to be identical with *I. spatula* Gilbert and Burke. The two species are separated in the males by the very different form of the urogenital papilla, and Jensen has found a characteristic on which to separate the females as well, namely the form of the lateral-line scales, which have well developed spines both dorsal and ventral to the lateral-line pore in *bicornis,* but only dorsal to the pore in *spatula.* The present known distribution of *Icelus bicornis* on this new definition is not circumpolar, but extends from the Canadian eastern arctic to Spitsbergen and the Barents and Kara Seas. At both ends of its range it mingles with *spatula.* Vladykov (1933) reported *bicornis* (old definition) from Hudson Bay; his specimens have not been examined by the present authors. All six of them were females.

Three specimens of this species were taken in the dredge in Ungava Bay, at station 126 (between Payne Bay and Akpatok Island) in 75 metres of water, in August 1949. One is a male, measuring 41 mm. standard length (50 mm. total length), and the other two are females measuring 88.5 and 61 mm. standard length (approximately 102 and 73 mm. respectively total length; the tails are damaged). The lateral-line scales are typical according to Jensen's (1949) figures and description.

**Icelus spatula** Gilbert and Burke

This species fills in the part of the circumpolar range in which *bicornis* is not found, according to present knowledge, from the Kara Sea eastward to the Bering Sea, and probably along the North American arctic coast to Hudson Strait and Davis Strait. The species is not so far known from the central Canadian arctic or from the north coast of Alaska, but there is small doubt that this is due to the small amount of collecting that has been done in those parts. As mentioned above, it is separated from *bicornis* by the markedly different shape of the urogenital papilla in the male, which is short with a narrow prolongation in *bicornis,* and long and expanded in *spatula;* and by the form of the lateral-line scales in both sexes.

*Icelus spatula* has been taken in west Greenland, but not in east Greenland, and once off Exeter sound in eastern Baffin island. It is known from the Bering Sea, the Kamchatka coast, and along the Siberian shelf west to the Kara Sea. In Ungava Bay, it was taken in the same dredge haul as produced the *I. bicornis* just described, at station 126 in August 1949. Four specimens were obtained, two males and two females, measuring 54.5, 58, 45 and 44 mm. standard length (64, 68, 55 and 53 mm. total length approximately). Although the lateral-line scales agreed in general with Jensen's description and figures, in lacking the two or more spines ventral to the pore, there was some variation in the precise form of this ventral lobe of the scale. There is a posterior projection immediately ventral to the pore which in two of the specimens ap-

proached the form of a true spine. Such a variation is in fact suggested by Jensen's figures, but is not mentioned in the text. If *bicornis* and *spatula* are in fact good species, they certainly appear to occupy the same habitat where they overlap, since both species were obtained in the same haul, and nowhere else.

**Aspidophoroides olriki** Lütken. Sea poacher

Known from Greenland waters, Hudson Bay and arctic seas generally; Murman coast, Kara Sea, Bering Sea; probably circumpolar. South to northern Norway and Newfoundland. In Ungava Bay, A. P. Low collected one specimen in 1897. The 1947-49 material consists of five pelagic young taken in plankton nets at station 1 (1947) and stations 101 and 103 (1949); and three adults taken in the dredge at station 33 (1947) and stations 102 and 106 (1949), at depths ranging from 27 to 130 metres.

**Eumicrotremus spinosus** (Müller). Spiny lumpfish

This widespread North Atlantic and arctic fish was taken only twice during the 1947-49 field work, once in the dredge in Keglo Bay (station 33) and once in a plankton net at station 103, off Forbes Sound. The dredged specimen measures 31 mm. and was taken in 25 metres of water; the planktonic specimen, 8 mm. total length, was caught between five and ten metres below the surface.

Family LIPARIDAE: The taxonomy of the liparids is still in a somewhat chaotic state, in spite of fairly recent publications which have individually illuminated the situation, but which taken together obscure it again owing to the disagreement shown. So far as the present material is concerned, the issue is one of the status of *Liparis liparis* (Linnaeus), *Liparis tunicatus* Reinhardt, and *Liparis major* (Gill). In the determination of the present material we have referred both to the review of the genus published by Burke (1930) and to Parr's (1932) discussion of the species *L. liparis* and *L. koefoedi;* but there are points of uncertainty not covered by either author. In many respects one solution of the problem would be to return to Ehrenbaum's (1905) very broad definition of *L. liparis,* which includes the present *liparis, tunicatus* and *atlanticus,* and might be made to include more still, with the acceptance of the proposition that *L. liparis* is a highly variable species.

**Liparis atlanticus** (Jordan and Evermann). Sea-snail; nipisak (these common names apply to all the liparids)

This species is known from rocky shores of eastern North America from Cape Cod to Quebec Labrador. The present Ungava Bay record is based on a single specimen taken in a tide-pool at station 51 (Pitsulasitik, between the George River and Whale River), with the following determining characteristics: total length 87 mm.; D 35, A 28, P 28; gill opening very small, above base of pectoral rays; dorsal fin notched, the first four rays prolonged and with the ends free; dorsal separate from caudal; anal attached to caudal.

This appears to be the first record of the species north of the Gulf of St. Lawrence, and it is to be expected that present researches along the Labrador coast will find it there.

**Liparis tunicatus** Reinhardt

Burke (1930) recognizes this species as distinct from the European *L. liparis*, although the writers are aware that the European authors, notably Jensen, do not consider the Greenland liparid *Cyclopterus liparis* of Fabricius (1780), upon which Reinhardt based the species *tunicatus*, as distinct from European *L. liparis*. Burke's (1930) specimens came from the collection of Lucien Turner, from Ungava Bay.

The present material consists of twelve specimens taken by dredge and in tide-pools, and a few in plankton nets which are large enough for certain identification. There are also several damaged specimens from cod stomachs at Burwell, and a large number (over 150) of small planktonic young which are not certainly identifiable, and which may include individuals of the next species (*L. koefoedi*). Apart from planktonic catches, which were made at a variety of stations, *L. tunicatus* was taken at Burwell, Keglo Bay, Tunulik, Leaf Bay, and off the mouth of Payne Bay (station 126). It is one of the commonest fishes in the bay, and appears to make a habit, in the post-larval and adult stages, of swimming up into the surface layers during the night. The planktonic young were very abundant, next in numbers to those of *Myoxocephalus scorpius*. The largest specimen taken measured 157 mm. total length; those taken in tide-pools were under 100 mm.

The synopsis of the identifiable specimens is as follows: D 42-43; A 33-36; P 36-38; pyloric caeca 30-35; gill opening small, extending opposite 3-6 pectoral rays. Colour typically brown, "the colour of glue", with numerous melanophores; one specimen taken over black mud at Port Burwell was nearly black in colour when captured, but changed to brown when kept alive in a jar of water on deck.

Two doubtful specimens are referred to this species pending confirmation or complete revision of the genus. One, taken in the dredge at station 126, measures 65 mm., and differs from the typical *tunicatus* pattern in the following characters: pectoral 40, eye 4.3 in head (as opposed to 5-6 in head for the typical *tunicatus*), gill slit smaller, overlapping only one pectoral ray. The size of the eye, and of the gill slit, resembles the condition found in the northwestern form *herschelinus* Scofield. The colour pattern is not typical of either species, being varied with an irregular banding of darker brown upon the normal brown field. The colour pattern in *L. liparis* and *L. tunicatus*, however, is known to be variable. In other characteristics this specimen answers to *tunicatus* without difficulty: D 43, A 35, pale peritoneum, notched pectoral, unnotched dorsal, etc.

The other doubtful specimen was taken in a plankton net at station 101, at the surface, at midnight on June 26-27, 1949, and measures 132 mm. total length. It departs from the definition of *tunicatus* given by Burke (1930) in the number of dorsal rays, but it appears to be still farther away from other species of the genus. D 35, A 34, P 36; vertebrae 48, pyloric caeca about 40, peritoneum pale; gill slit extends down opposite four pectoral rays. The low number of dorsal rays will not fit into Burke's key; the only species it fits is the *Liparis liparis* of Ehrenbaum (1905), of which the definition allows for considerable variation in the number of fin rays.

**Liparis koefoedi** Parr, 1932; (syn. *Liparis major* (Gill) of Burke, 1930, partim)

An arctic species, circumpolar. Parr (1932) has shown that the *Liparis major* (Gill) of Burke (1930), is not the same as the *Cyclopterus liparis major* of Fabricius (1780), to which Burke referred it, which latter form should therefore retain the name *major; Liparis major* (Gill), along with various identifications of *Liparis fabricii*, has been given the new name *koefoedi*. (The original *L. fabricii* of Krøyer appears to have been in fact identical with *L. l. liparis*. The "*L. fabricii* Krøyer" of Dunbar (1947a), from Hebron and Lake Harbour, should therefore be corrected here. These young specimens are probably all *Liparis koefoedi*, but may include also some *L. tunicatus*.)

*Liparis koefoedi* can be distinguished from all other members of the genus by the very dark peritoneum, and by the high number of dorsal and anal rays. It is also distinguished from other liparids in the Ungava Bay region by the fact that the inner teeth in each jaw are large and simple, not trilobed.

The Ungava Bay material consists of a number of specimens varying in length from 40 to 91 mm., including one taken by dredge, station 106 (outside Forbes Sound) July 7, 1949, five taken in plankton nets in deep water (220-230 metres wire) at station 103, July 6 and 14, 1949, and about twenty specimens taken from cod stomachs at Port Burwell, 1948 and 1949. The fin-ray formula of the undamaged specimens was: D 46-48, A 38-41, P 33-35, which is in close agreement both with Burke's description of *Liparis major* (Gill) and Parr's account of *L. koefoedi* Parr.

**Eumesogrammus praecisus** (Krøyer)

Known from the coasts of Greenland, and from Hudson Bay and Port Burwell (Vladykov, 1933). Also from Bering Strait and the Sea of Okhotsk. Represented in the present collection by one specimen from a cod stomach at Burwell, taken on August 23, 1947, and four planktonic young taken close to the surface at station 129 (southwest Ungava Bay) on August 25, 1949. Ova in the adult (1947) specimen were almost ripe. Fin-ray numbers on the largest of the planktonic young (25 mm. total length) were: D 45, A 37, P 16. It is possible that not all the dorsal rays are developed.

**Lumpenus maculatus** (Fries)

Known from the North Atlantic region from west Greenland south to New England, and in Scandinavian waters; also from Spitsbergen, the Murman coast, Barents Sea, and from the Bering Sea, south to the Aleutian Islands. In the eastern arctic of Canada, one specimen was taken in Jones Sound by the "Godthaab" expedition of 1928. According to Jensen (1944) it is the commonest member of the genus in Greenland waters, but it appears to be less common in Ungava Bay, on present findings, than *L. fabricii*. In Ungava Bay it is known from Burwell only, two specimens having been taken from cod stomachs on August 2, 1948. It is easily identified in the field by the prolongation of the lower pectoral rays.

**Lumpenus fabricii** Reinhardt

A widespread species in arctic and sub-arctic waters, circumpolar. Vladykov (1933) has recorded it from Hudson Bay. In Ungava Bay it is probably one of the commoner members of the bottom fauna. Specimens were taken from cod stomachs on August 21 and 22, 1947, and on August 2, 1948; and 13 planktonic young were taken in 1947 at stations 1, 22, 37, 43, 51, 106 and 103, some of which are too small for certain identification; others, with fin rays fully developed, are readily recognizable. One specimen was taken from a ringed seal stomach on July 7, 1948, off the mouth of the Koksoak River.

**Lycodes reticulatus** Reinhardt. Eelpout; sulupavak

A North Atlantic species, from Greenland and Spitsbergen south to New England; recorded from Hudson Bay by Vladykov (1933). Taken twice in Ungava Bay during the 1947-49 field work, once on a long-line trawl in Forbes Sound, in 35 fathoms of water (station 46, August 24, 1947), and once from the stomach of a bearded seal (*E. barbatus*) off the Gyrfalcon Islands on July 16, 1948. Other lycodids were also obtained from cod stomachs, but could not be identified with certainty. The specimens belong to the typical *reticulatus* subspecies, not to the subspecies *L. r. hacheyi* set up by Vladykov (1933) based on two specimens from Hudson Bay.

**Gymnelis viridis** (Fabricius)

A circumpolar arctic species, common also in the subarctic, south in North America to Nova Scotia. Eight specimens were taken from cod stomachs at Burwell, in August 1947 and 1948, and two specimens from a bearded seal stomach, Gyrfalcon Islands, in July 1948.

## CONCLUSION

There is no doubt that the number of species recorded here for Ungava Bay (44 in all, including one (*Couesius plumbeus*) which has been found only at some distance from the bay itself, although within the Ungava Bay watershed) will be considerably increased as the study of the area continues. The fact that it was necessary, owing to the nature of the bottom, to rely on dredges rather than trawls for the benthonic collecting, has probably resulted in certain species having been overlooked. It is probable, from a study of the hydrographic conditions, that the number of species ultimately recorded for the bay will lie somewhere between the known numbers for Hudson Bay and for west Greenland, the former environment being strictly arctic and the latter markedly subarctic. It might also be expected that the greater variety of species will be found in the vicinity of Port Burwell, where the subarctic influence is strongest; this pattern of distribution is indeed apparent from the present collection.

It is not considered that the field study of the fishes of Ungava Bay has yet reached the stage where it is feasible to discuss the material in zoogeographic

terms; that is, to give significance to the fact that several species have so far been found only in certain parts of the bay and not elsewhere—always with the obvious exceptions of the Atlantic species (*Gadus callarias, Salmo salar*) which occur only in the eastern part of the bay. It is interesting, on the other hand, to consider the known fish fauna of the bay as a whole (1) to determine where in the arctic-Atlantic scale the fauna should be put, and (2) to examine its position in the Pacific-Atlantic scale. Not only is the present set of the water north of continental arctic Canada a west-east movement, but there are historical connections between the waters of the western (Pacific-influenced) arctic and those of Hudson Bay; a Pacific flavour in the fauna of the eastern arctic waters is therefore not unexpected.

Thirteen of the species recorded here are predominantly or entirely of fresh-water habit. The remaining 31 species are marine (including the anadromous arctic char), and can be divided into five geographical groups as follows, which show that the fauna of Ungava Bay is, on the whole, subarctic:

(1) Arctic species, found only in the fringes of the subarctic: *Boreogadus saida, Triglops nybelini, Oncocottus quadricornis.*

(2) Arctic-subarctic fishes, of wider tolerance than group (1): *Salvelinus alpinus* (predominantly arctic), *Gadus ogac* (predominantly subarctic), *Reinhardtius hippoglossoides, Myoxocephalus scropioides, Gymnocanthus tricuspis, Icelus bicornis, I. spatula, Aspidophoroides olriki, Liparis koefoedi, Eumesogrammus praecisus, Lumpenus fabricii, Gymnelis viridis.*

(3) Subarctic-boreal species: *Salmo salar, Mallotus villosus* (predominantly subarctic), *Gadus callarias* (predominantly subarctic), *Sebastes marinus, Myoxocephalus scorpius, Liparis atlanticus.*

(4) Atlantic (boreal) species: *Paralepis rissoi krøyeri, Lampanyctus crocodilus.*

(5) Species of wide north-south range, in all three marine zones (arctic, subarctic, boreal): *Somniosus microcephalus* (predominantly subarctic), *Myctophum glaciale, Ammodytes dubius, Triglops pingeli, Eumicrotremus spinosus, Liparis tunicatus, Lumpenus maculatus, Lycodes reticulatus.*

The fresh-water species of the Ungava Bay drainage are predominantly subarctic (Hudsonian) and more southerly (Canadian zone) species. The number of fresh-water fishes found north of the tree-line is extremely small, a fact which is no doubt related to the productivity of the soil and hence of the lakes in the two regions. Excluding the ubiquitous arctic *Salvelinus alpinus*, only *Cristivomer namaycush, Coregonus clupeiformis, Prosopium cylindraceum*, and the two sticklebacks, *Gasterosteus aculeatus* and *Pungitius pungitius*, are found to any extent north of the tree-line, and most of them only to a limited distance.

Vladykov (1933) recorded two Pacific species (*Gymnocanthus galeatus, Liparis cyclostigma*) and one subspecies (*Triglops pingeli beani*) from Hudson Bay, none of which had been noted from the eastern arctic before. The present collection from Ungava Bay does not include these forms, and the only possible Pacific affinities which the Ungava Bay fauna has so far been shown to have are in the possession of *Icelus spatula*, and perhaps *Eumesogrammus praecisus.*

*Icelus spatula* is the relative of *I. bicornis* which takes the latter's place from the Kara Sea eastwards to the Bering Sea, and possibly (not yet confirmed) in the central Canadian arctic as well. It is known in the eastern arctic area from Ungava Bay (present record) and from stations in west Greenland, but not from east Greenland. Ungava Bay and west Greenland may to this extent be said to possess the Pacific member of the genus; both regions are zones of contact and overlap between the two species. *Eumesogrammus praecisus* is known from west Greenland, Ungava Bay, Hudson Strait, and from the Sea of Okhotsk and the Bering Sea (Jensen, 1944).

Only five of the species recorded are known to be truly circumpolar in distribution. Others may later be found to be so. The five known forms are: *Gasterosteus aculeatus, Lota lota, Boreogadus saida, Esox lucius, Oncocottus quadricornis.*

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